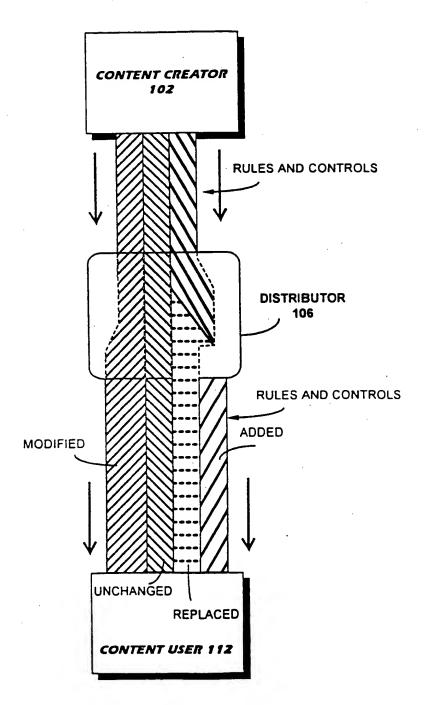
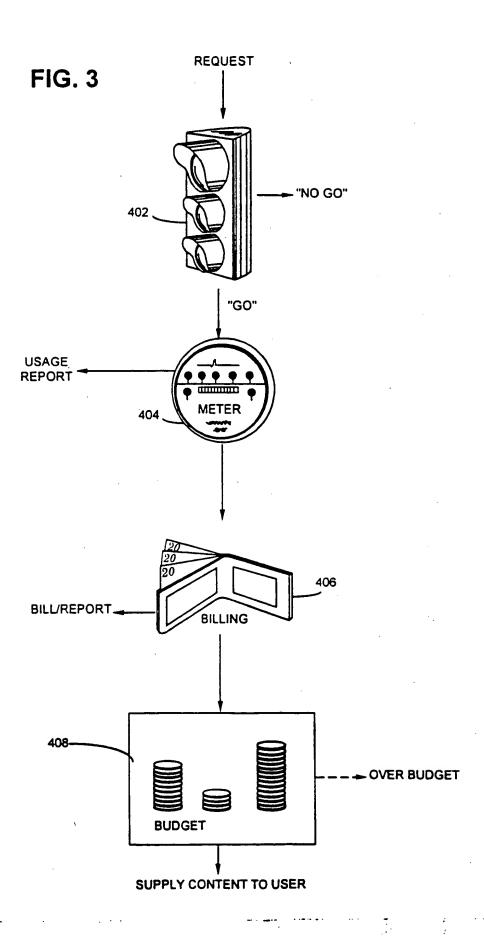
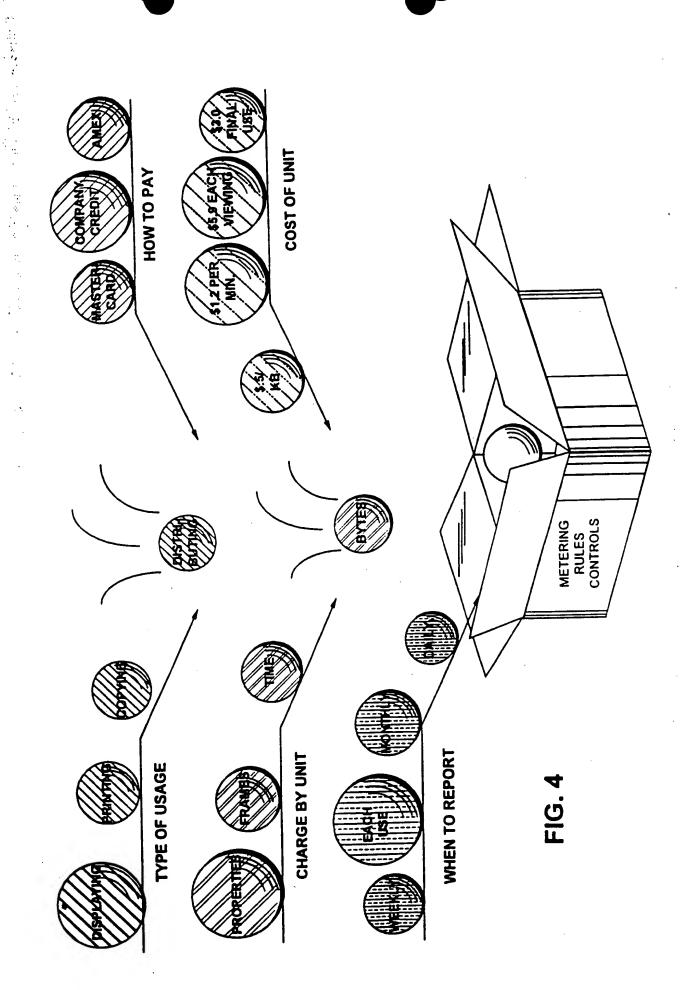


FIG. 2A

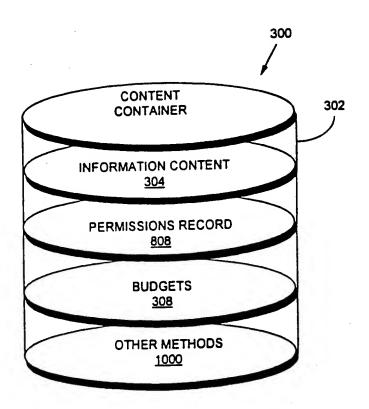






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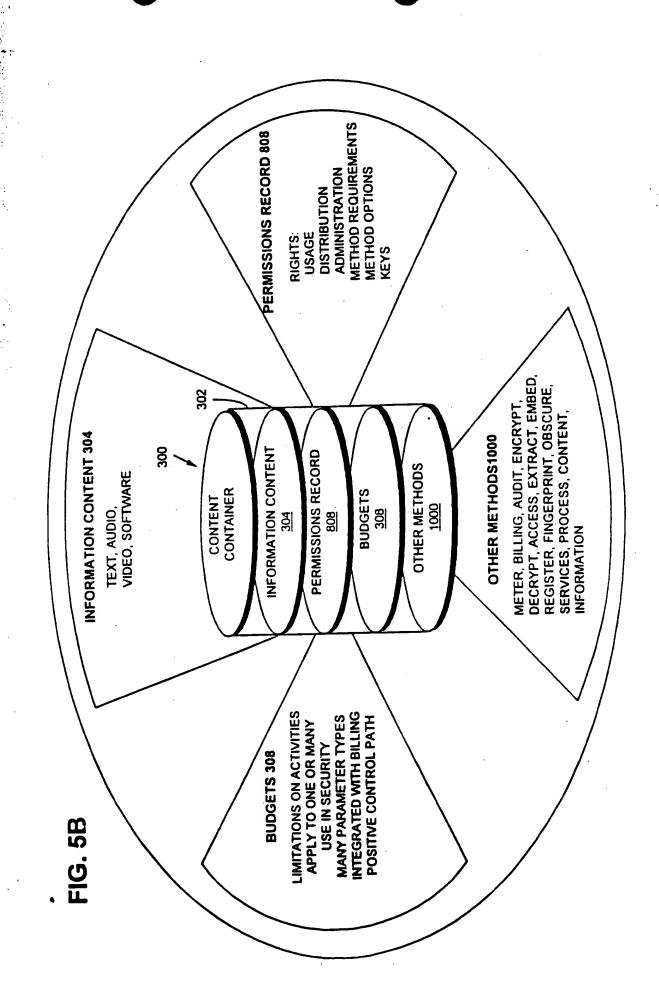
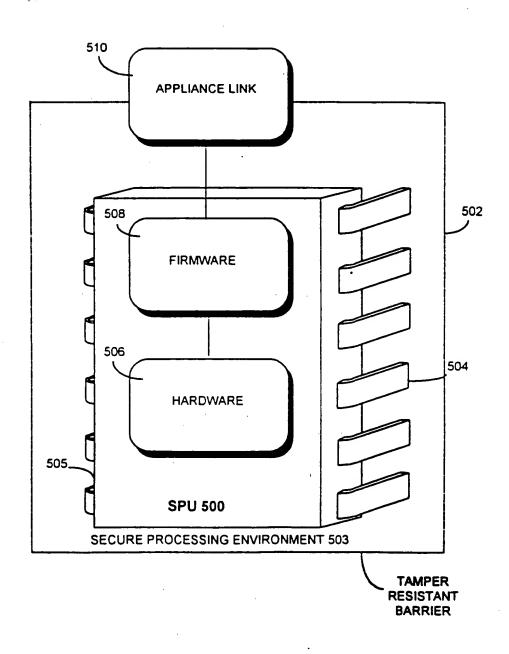
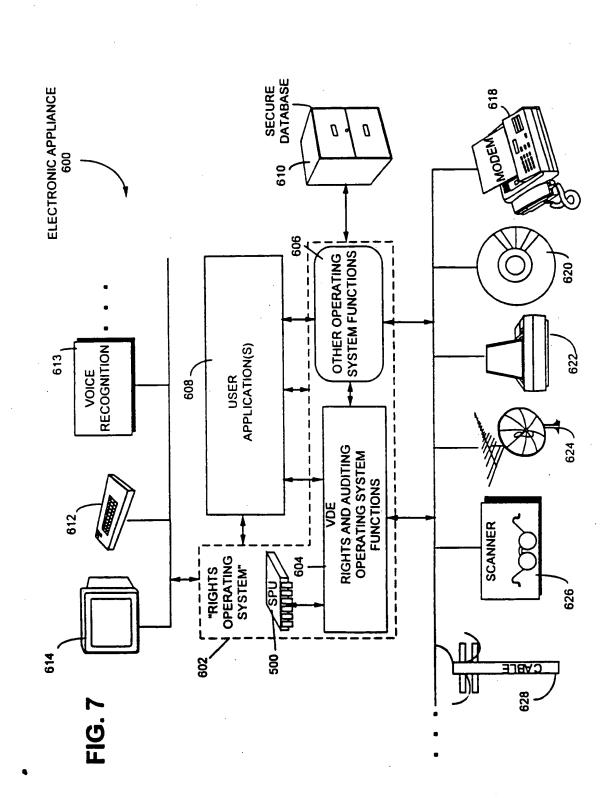
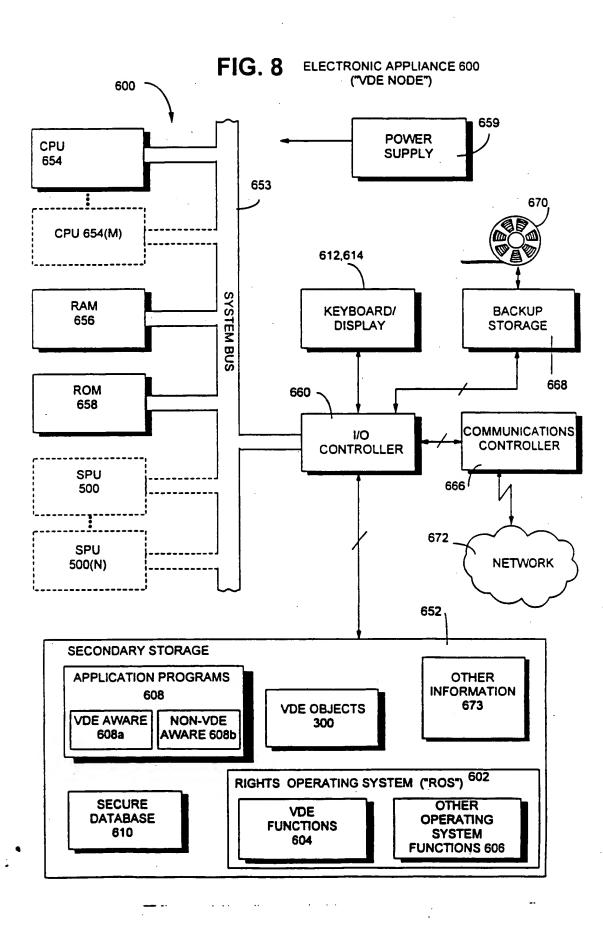
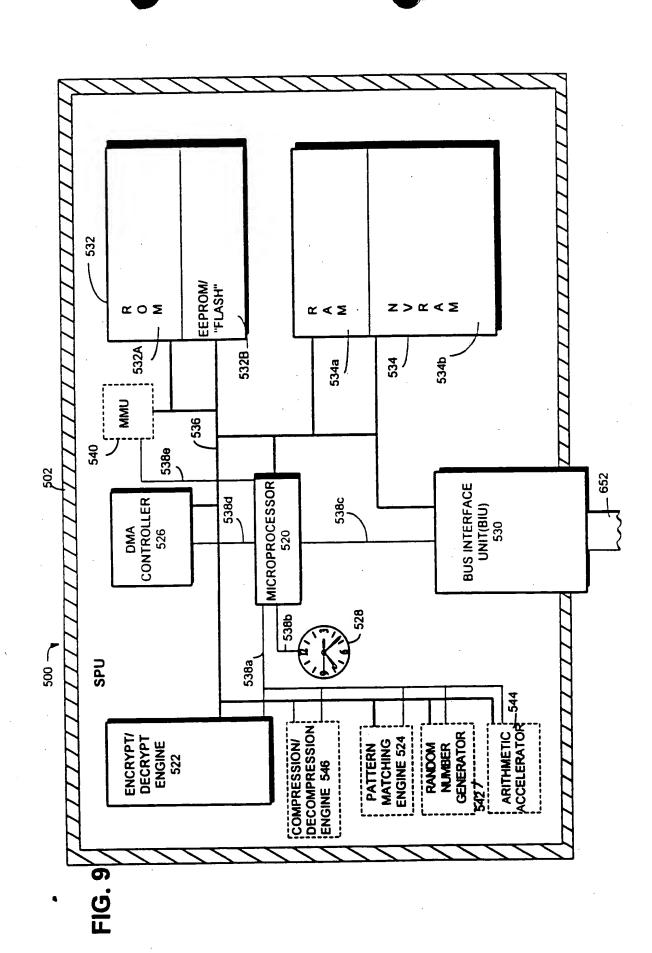


FIG. 6









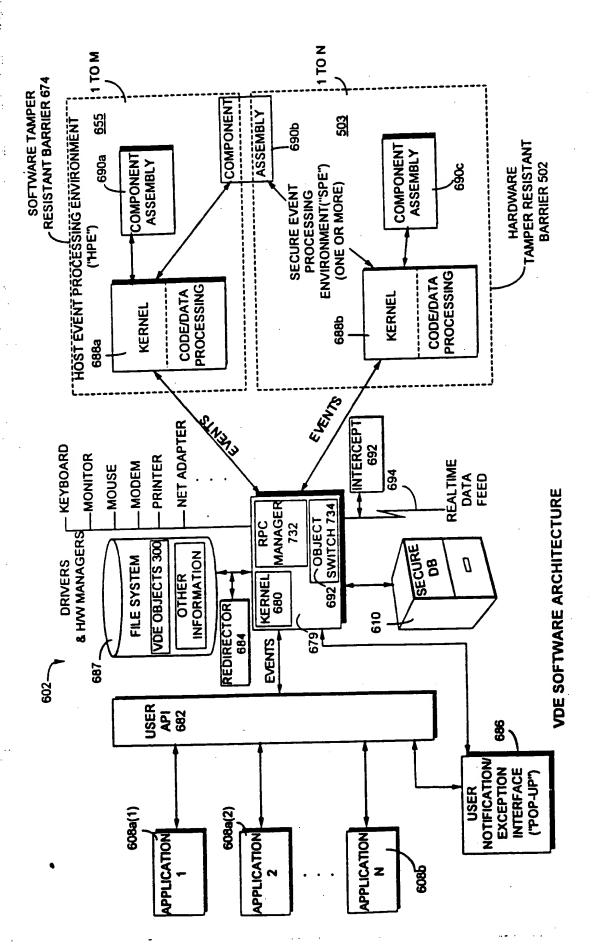
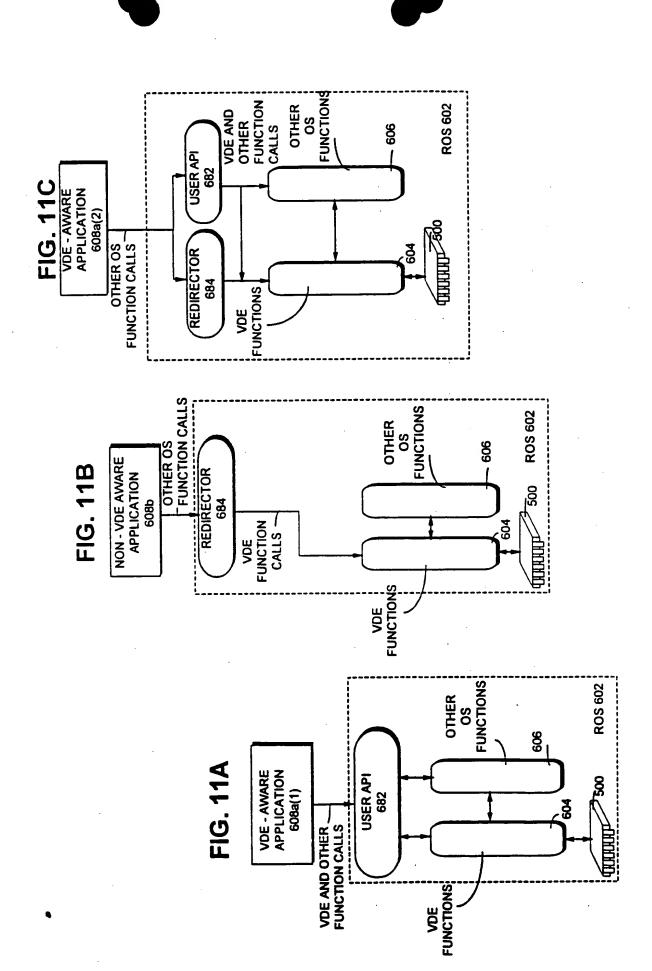
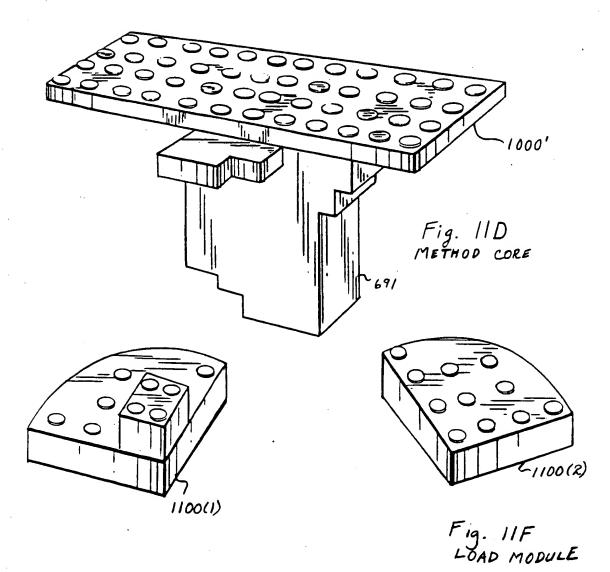
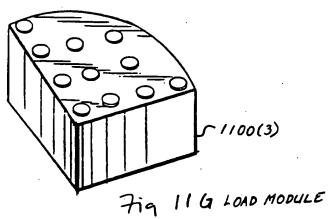


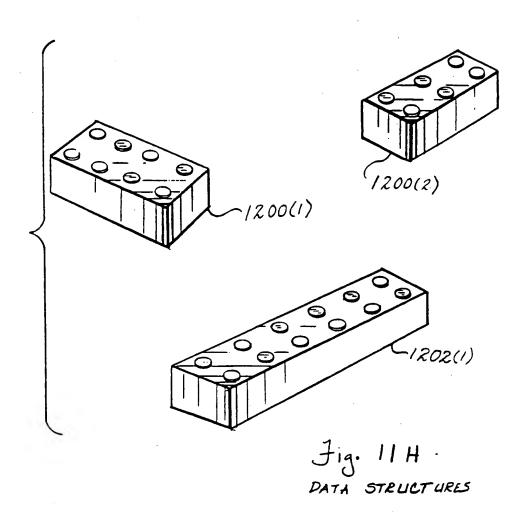
FIG. 10

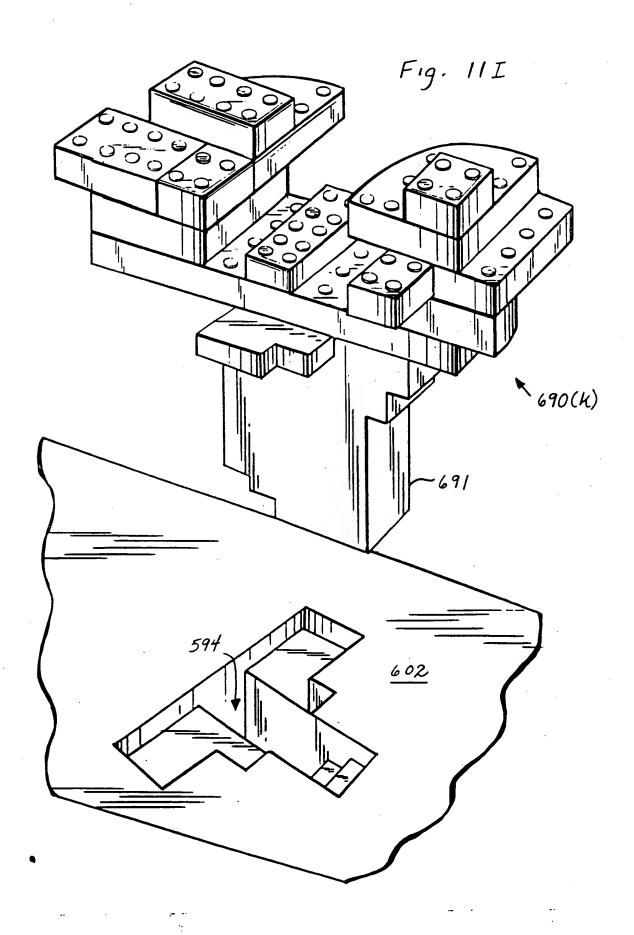


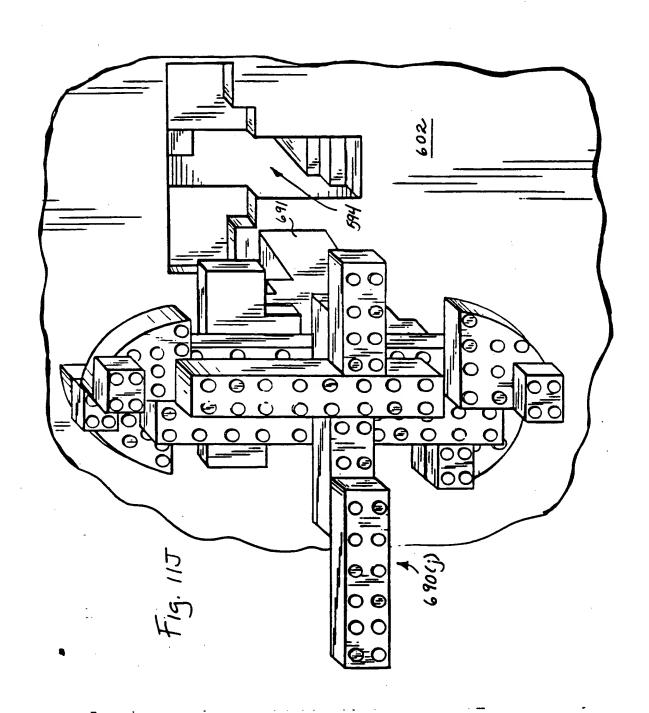


Tig. 111.

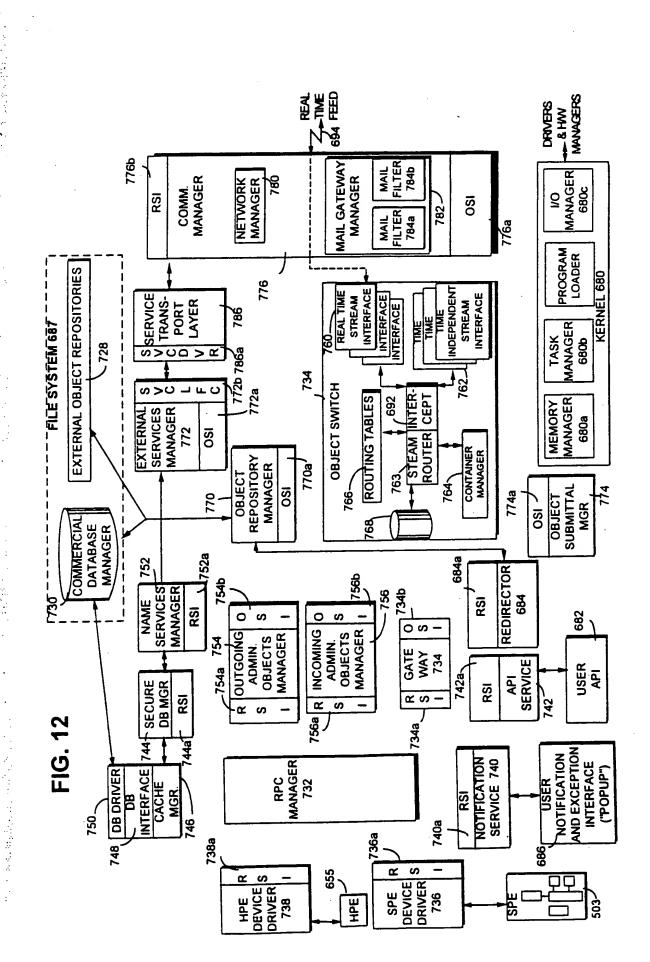


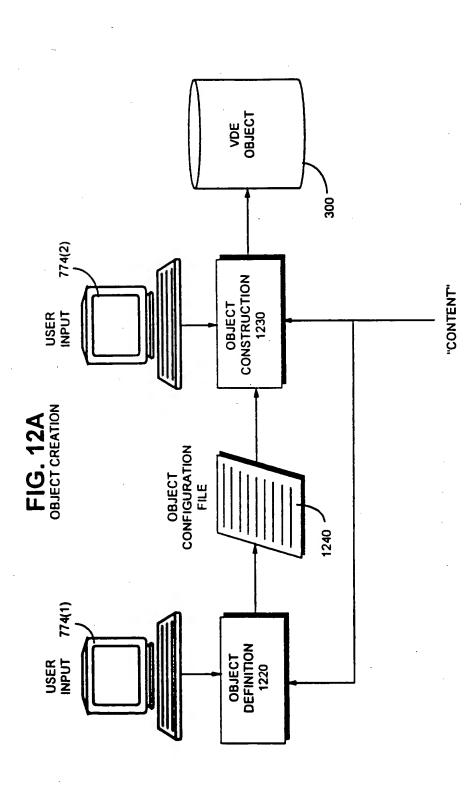






)





PROTECTED PROCESSING ENVIRONMENT 650

503, 655

FIG. 13

TO/FROM ► ROS KERNEL SERVICES OTHER INTERPRETER LOW LEVEL SERVICES MANAGER HANDLER MANAGER -------MEMORY KERNEL/DISPATCHER 552 DTD 590 \_BIU\_ 5821 578 592a a s 592 INTERRUPT HANDLER(S) INTERRUPT QUEUE(S) INTERNAL MANAGER SERVICE 588 / MANAGER MEMORY VIRTUAL 584 / TASK 580 576 RS 552a LM EXECUTOR LOAD MODULE (PROGRAM ROUTINES **EXECUTION** INTERNAL MANAGER LOADER) LIBRARY LMs 570 5747 572, 568a **5**65a 568 **SENERATOR** MANAGER RANDOM NUMBER RSI **RPC MANAGER 550** 565, MANAGER SECURE DB RSI **566a** MANAGER/ SECURE MANAGER COMMON RSI 5648 AUTH. CHANNEL SERVICES MANAGER 562 RS 562a SUMMARY SERVICES MANAGER RSI MANAGER RSI KEY & TAG 556a MANAGER **ENCRYPT/** RSI DECRYPT TIME BASE MANAGER RS 554



DEVICE FIRM WIRE LOW LEVEL SERVICES 582	
INITIALIZATION	
POST	
DOWNLOAD CHALLENGE/RESPONSE AND AUTHENTICATION	11
RECOVERY	
EEPROM/FLASH MEMORY MANAGER	
KERNEL/DISPATCHER 552	
INITIALIZATION	
TASK MANAGER 576 (SLEEP/AWAKE/CONTEXT SWAF	2)
INTERRUPT HANDLER 584 (TIMER/BIU/POWER FAILWATCHDOG TIMER/ENCRYPTION COMPLETED)	
BIU HANDLER 586	
MEMORY MANAGER 578	
INITIALIZATION (SETTING MMU TABLES	
ALLOCATE	
DELLOCATE	
VIRTUAL MEMORY MANAGER 580	
SWAP BLOCK PAGING	
EXTERNAL MODULE PAGING	
MEMORY COMPRESS	
RPC AND TABLES 650	
INITIALIZATION	
MESSAGING CODE /SERVICES MANAGER	
SEND/RECEIVE	
STATUS	
RPC DISPATCH TABLE	
RPC SERVICE TABLE	

FIG. 14A

TIME BASE MANAGER 554
ENCRYTION/DECRYPTION MANAGER 556
PK
BULK
KEY AND TAG MANAGER 658
KEY STORAGE IN EEPROM
KEY LOCATOR
KEY GENERATOR
CONVOLUTION ALGORITHM
SUMMARY SERVICES MANAGER 560
EVENT SUMMARIES
BUDGET SUMMARIES
DISTRIBUTER SUMMARY SERVICES
CHANNEL SERVICES MANAGER 562
CHANNEL HEADERS
CHANNEL DETAILS
LOAD MODULE EXECUTION SERVICES
568 AUTHENTICATION MANAGER/SECURE COMMUNICATION MANAGER 564
DATABASE MANAGER 566
MANAGEMENT FILE SUPPORT
TRANSACTION AND SEQUENCE NUMBER SUPPORT
SRN/ HASH
DTD INTERPRETER 590
LIBRARY ROUTINES 674  I/O CALLS(STRING SEARCH ETC.)
MISC. ITEMS THAT ARE PROBABLY LIBRARY ROUTINES
TAG CHECKING, MD5, CRC'S
INTERNAL LM'S 572 FOR BASIC METHODS
METER LOAD MODULE(S)
BILLING LOAD MODULE(S)
BUDGET LOAD MODULE(S)
AUDIT LOAD MODULE(S)
READ OBJECT LOAD MODULE(S)
WRITE OBJECT LOAD MODULE(S)
OPEN OBJECT LOAD MODULE(S)
CLOSE OBJECT LOAD MODULE(S)

SPU ROM/EEPROM/FLASH 532



## FIG. 14B

PUBLIC KEY AND PRIVATE KEY, SYSTEM ID, AUTHENTICATION CERTIFICATE, VDE SYSTEM PUBLIC KEY, PRIVATE DES KEY TOP LEVEL KEYS FOR OBJECTS TOP LEVEL BUDGET INFO METER SUMMATION VALUES KEY RECORDS FOR BUDGET RECORDS, AUDIT RECORDS, STATIC MANAGEMENT RECORDS, UPDATED MANAGEMENT RECORDS, ETC. DEVICE DATA TABLE SITE ID TIME **ALARMS** TRANSACTION/SEQUENCE #'S MISCELLANEOUS **MEMORY MAP** MAP METERS LM/UDT TABLE TASK MANAGER 576 CHANNEL(S) SUMMARY SERVICES 560 SECURE DATABASE TAGS SRN ENTRIES HASH ENTRIES

NON-VOLATILE MEMORY 534b

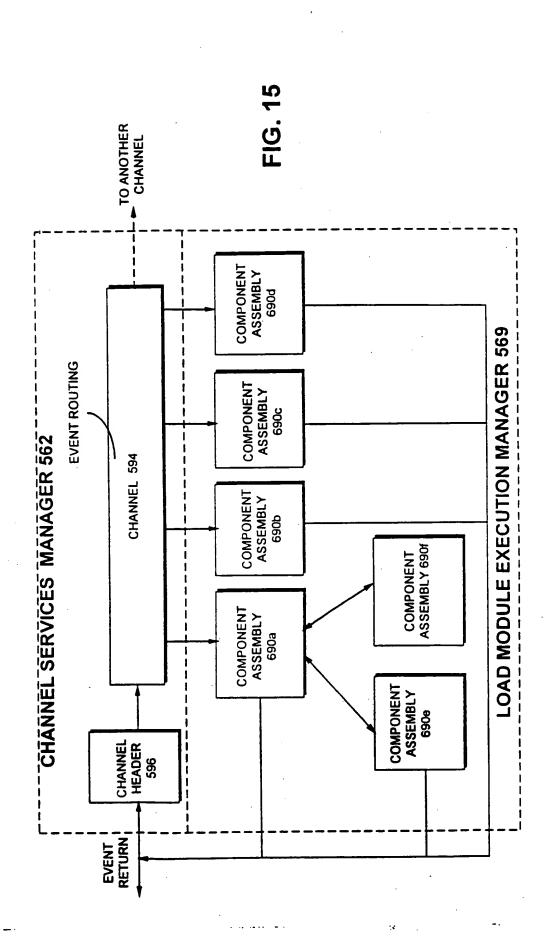
**1** 



## FIG. 14C

CHANNEL SWAP BLOCK	CHANNEL LM
	<u> </u>
	CHANNEL HEADER & D1
CONTROL SWAP BLOCK	CONTROL LM
	CONTROL D1
	COMMIT LM
	COMMIT D1, D2, D3
EVENT SWAP BLOCK	
EVENT OWN BEOOK	EVENT LM
	MAP TABLE (SINGLE) D1
METER SWAP BLOCK	
	METER LM
	METER UDE DELTA, DELTA
	METER TRAIL LIDE
	METER TRAIL UDE DELTA,DELTA'
DUDGET 0W45 51 00K	022111
BUDGET SWAP BLOCK	METER LM
	METER UDE DELTA, DELT.
	METER TRAIL LM
	METER TRAIL UDE
	DELTA,DELTA'
BILLING SWAP BLOCK	
	BILLING LM
	METER UDE
	BUDGET UDE
	BILLING TABLE UDE
	BILLING TRAIL LM
	BILLING TRAIL UDE DELTA

SPU RAM 532



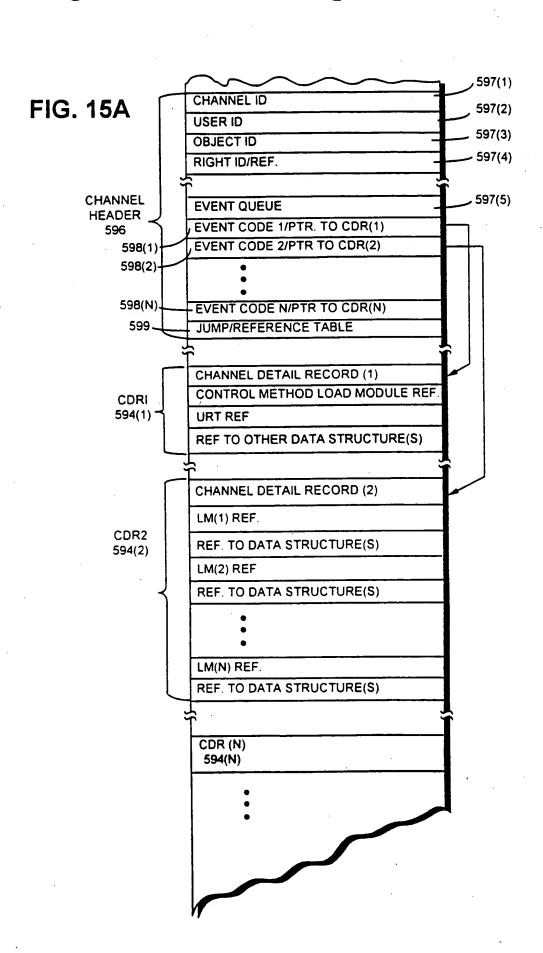
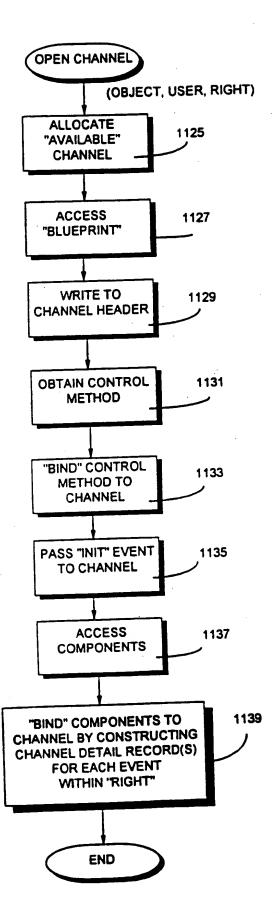


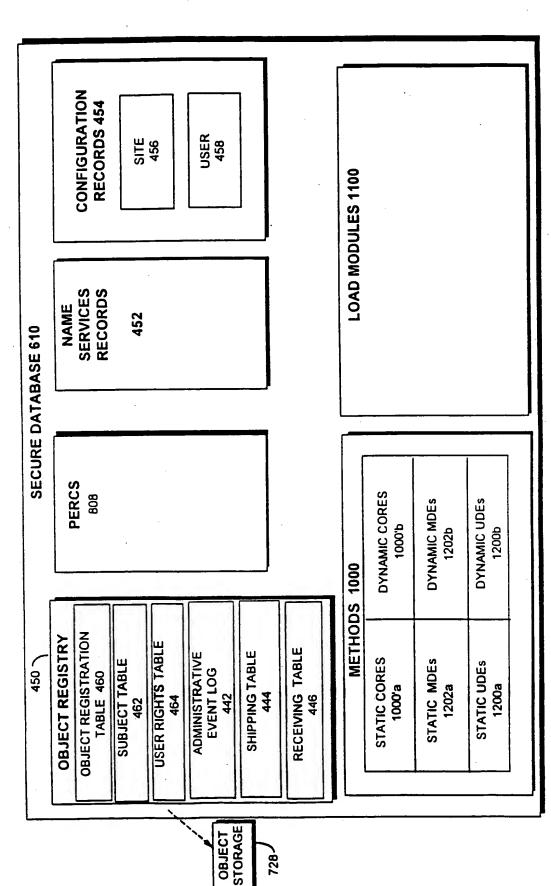
FIG. 15B

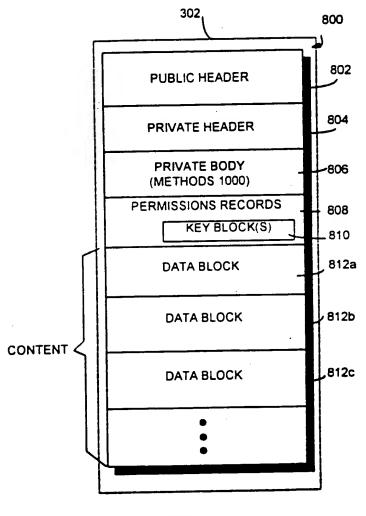


\* \*\*

31.5

FIG. 16





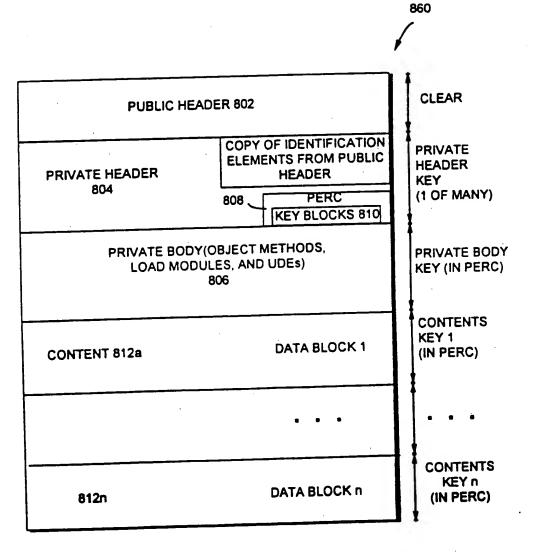
LOGICAL OBJECT

FIG. 17

850 **PUBLIC HEADER 802** CLEAR COPY OF IDENTIFICATION PRIVATE **ELEMENTS FROM PUBLIC** PRIVATE HEADER HEADER **HEADER** 804 KEY (1 OF MANY) PRIVATE BODY(OBJECT LOCAL METHODS, LOAD MODULES, AND UDEs) **PRIVATE BODY** KEY (IN PERC) 806 **CONTENTS** CONTENT 812a KEY 1 DATA BLOCK 1 (IN PERC) CONTENTS 812n DATA BLOCK n KEY n (IN PERC)

STATIONARY OBJECT

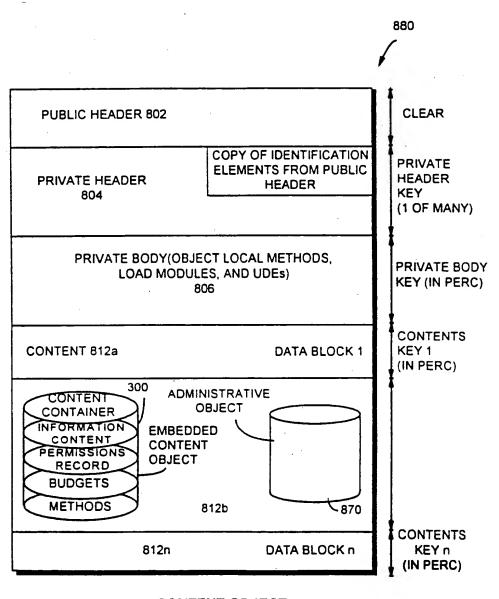
FIG. 18



TRAVELING OBJECT

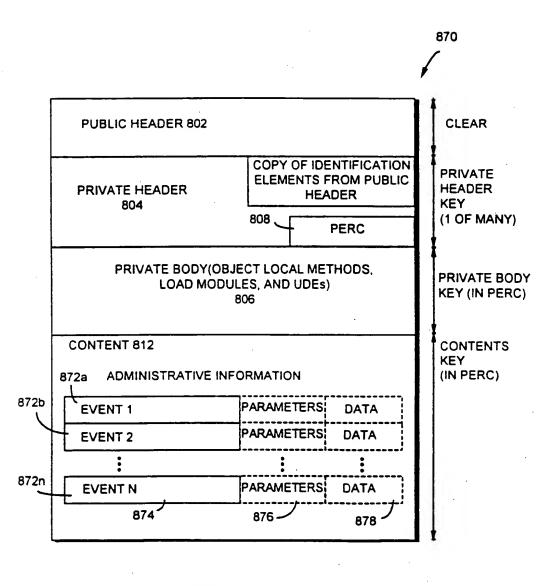
FIG. 19

4 19 W



**CONTENT OBJECT** 

FIG. 20



ADMINISTRATIVE OBJECT FIG. 21



1000'

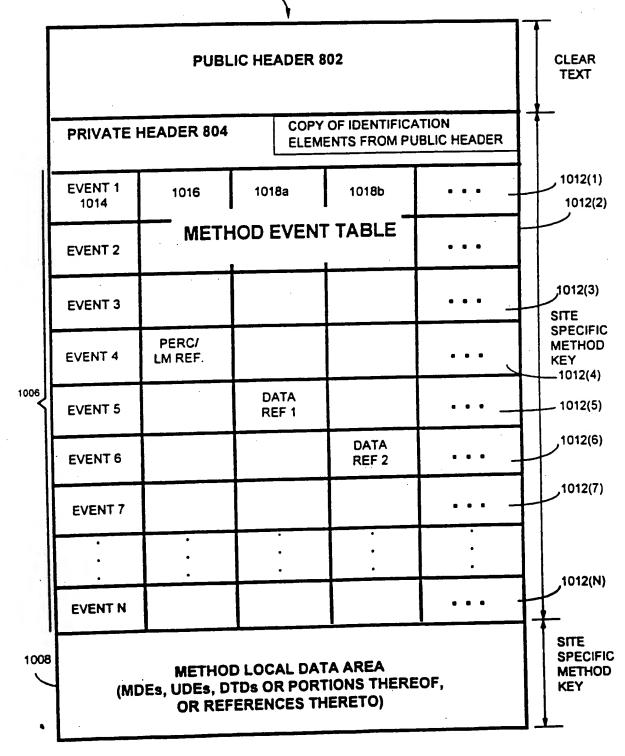
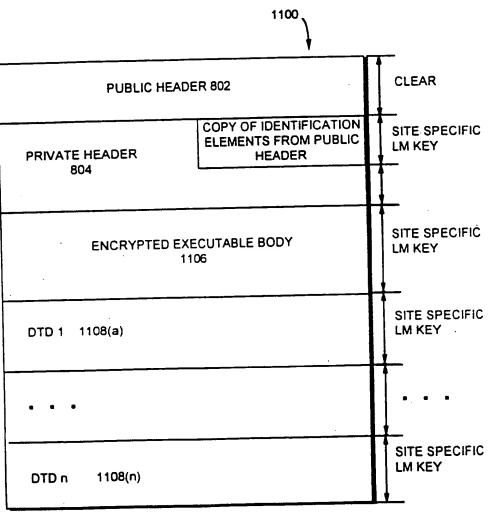


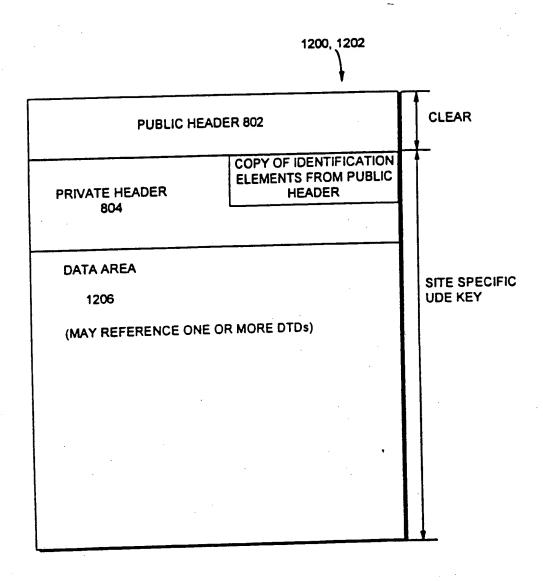
FIG. 23



LOAD MODULE



## FIG. 24



UDE (MDE)

W. John



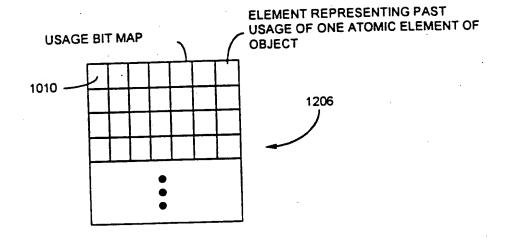


FIG. 25B

	TIME						
	-	JAN.	FEB.	MAR.	APRIL	MAY	JUNE
RECORDING NUMBER	1	0	2	0	1	0	0
	2	0	0	5	10	3	٥
	3	0	3	2	1	0	
	4	0	0	0	1	0	y
	5	0	0	1	0		
	6	0	0	0	سر		
	120	6 —	1				

FIG. 25C

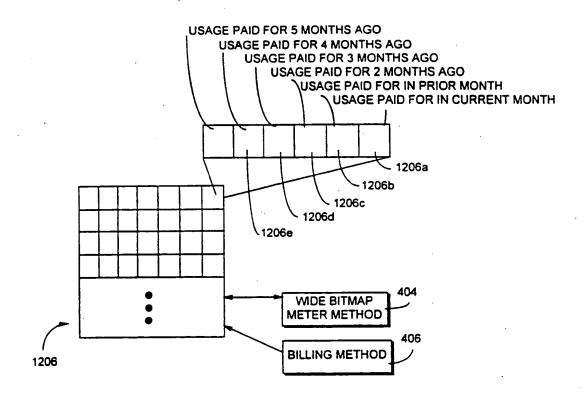


FIG. 25C

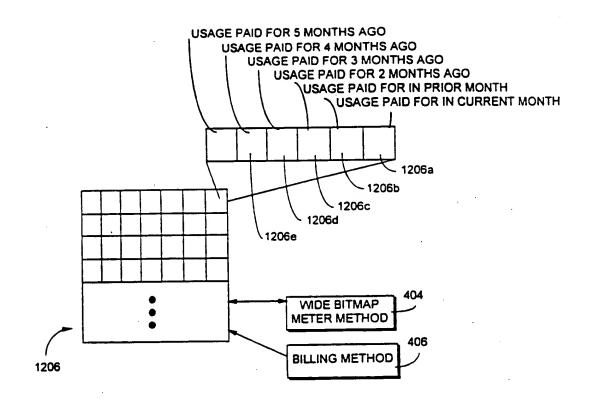
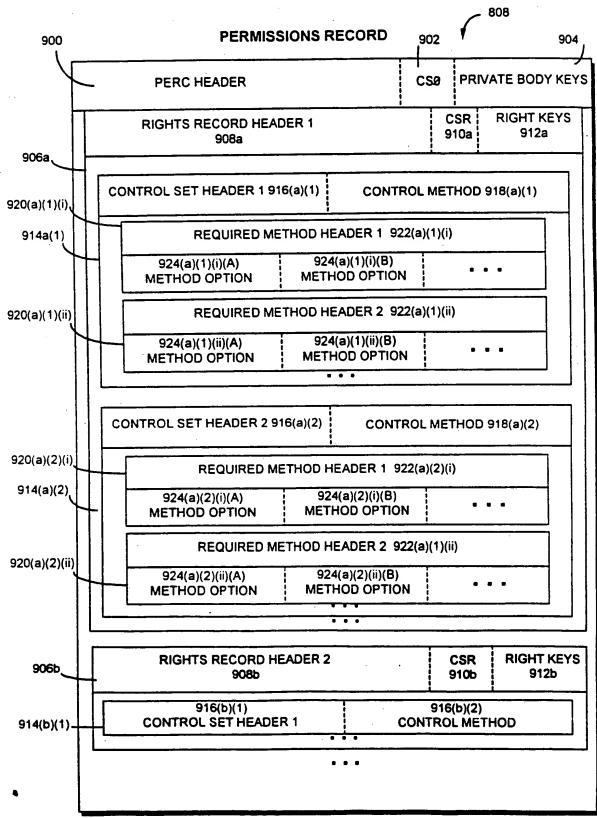


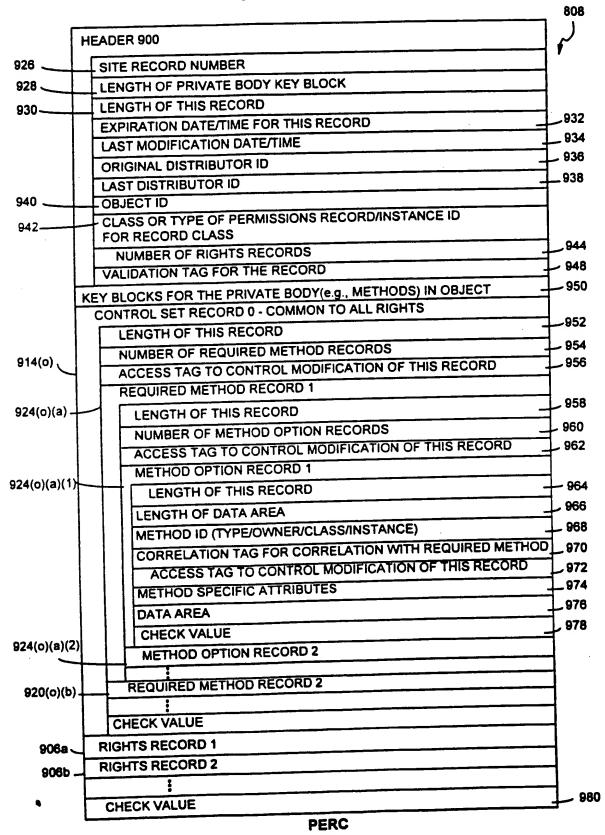


FIG. 26





## **FIG. 26A**



. \* X.

FIG. 26B

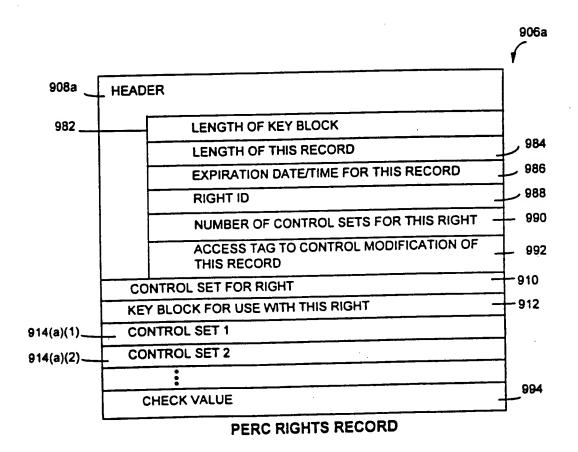




FIG. 27 SHIPPING TABLE

444A(1) SITE RECORD NUMBER **USER (GROUP) ID** 444A(2) REF. TO "FIRST" COMPLETED OUTGOING SHIPPING RECORD 444A(3) REF. TO "LAST" COMPLETED OUTGOING SHIPPING RECORD 444A(4) REF. TO "FIRST" SCHEDULED OUTGOING SHIPPING RECORD 444A(5) HEADER 444A REF. TO "LAST" SCHEDULED OUTGOING SHIPPING RECORD 444A(6) VALIDATION TAG FROM NAME SERVICES RECORD 444A(7) VALIDATION TAG FOR "FIRST" OUTGOING SHIPPING RECORD(S) .444A(8) . 444A(9) **CHECK VALUE** SITE RECORD NUMBER .445(1)(A) FIRST DATE/TIME FOR SCHEDULED SHIPMENT ,445(1)(B) LAST DATE/TIME FOR SCHEDULED SHIPMENT 445(1)(C) 445(1)(D) ACTUAL DATE/TIME OF COMPLETED SHIPMENT 445(1)(E) OBJECT ID OF ADMINISTRATIVE OBJECT (TO BE) SHIPPED 445(1)(F) REF. TO ENTRY IN ADMINISTRATIVE EVENT LOG REF. TO NAME SERVICES RECORD NAMING RECIPIENT 445(1)(G) 445(1)(H) PURPOSE OF SHIPMENT SHIPPING STATUS OF SHIPMENT . 445(1)(I) RECORD REF. TO "PREVIOUS" OUTGOING SHIPPING RECORD 445(1) . 445(1)(J) .445(1)(K) REF. TO "NEXT" OUTGOING SHIPPING RECORD 445(1)(L) **VALIDATION TAG FROM HEADER** .445(1)(M) VALIDATION TAG TO ADMINISTRATIVE EVENT LOG .445(1)(N) **VALIDATION TAG TO NAME SERVICES RECORD** 445(1)(0) **VALIDATION TAG FROM PREVIOUS RECORD** -445(1)(P) VALIDATION TAG TO NEXT RECORD 445(1)(Q) **CHECK VALUE** 445(1)(R) SHIPPING RECORD N



## FIG. 28 RECEIVING TABLE

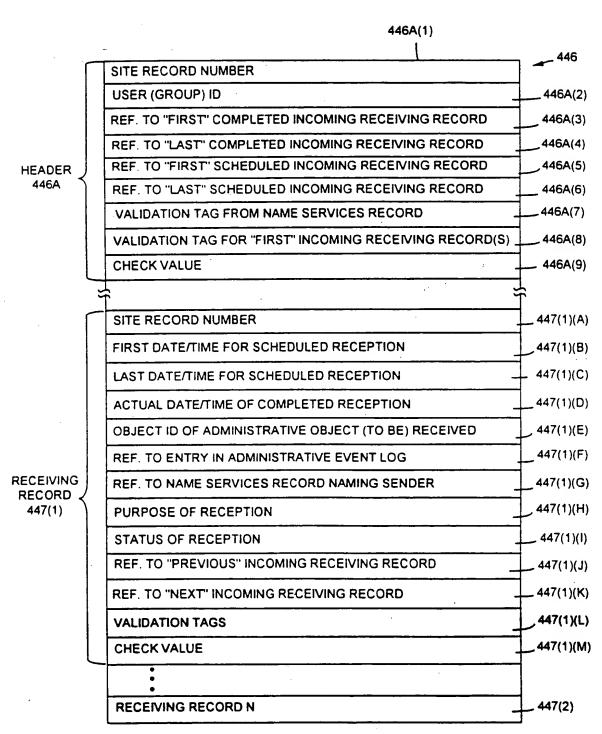
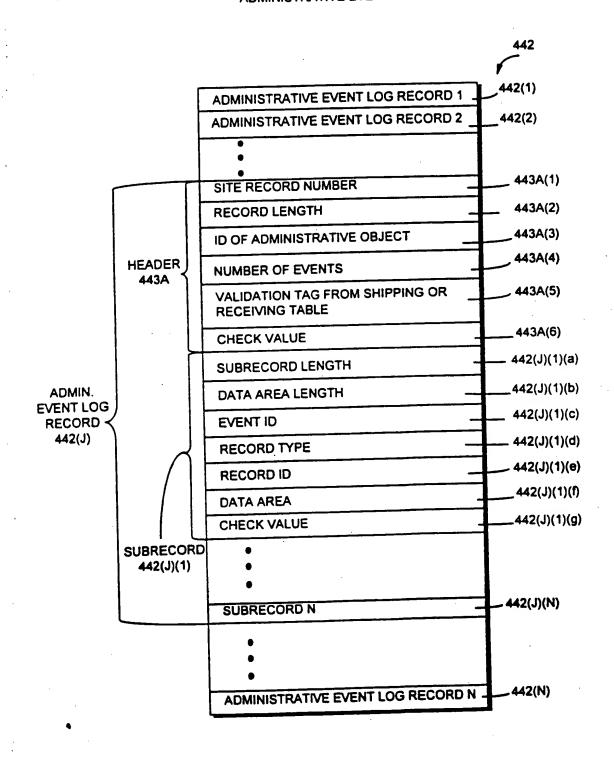
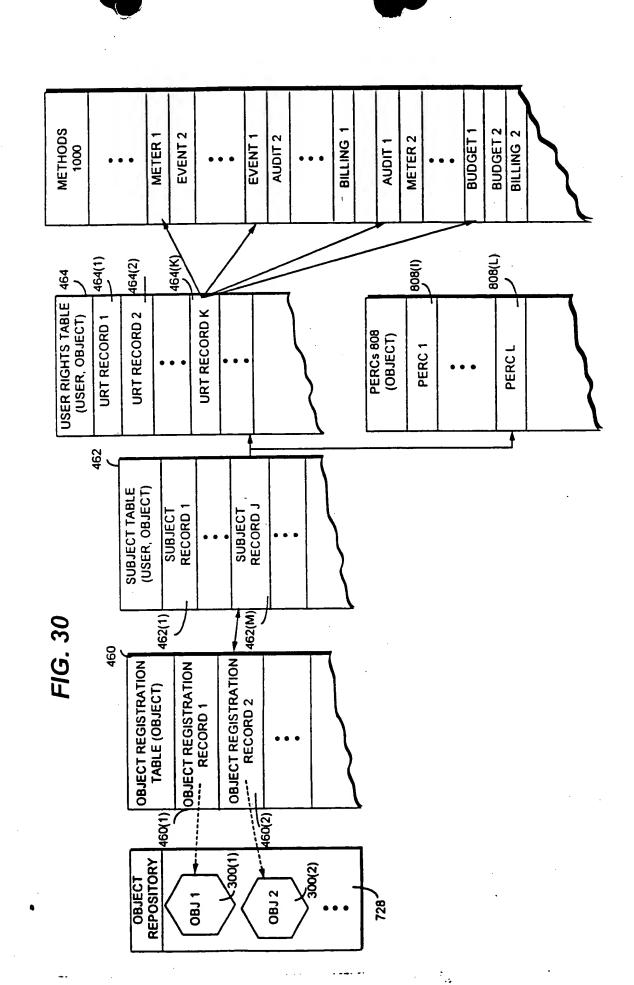


FIG. 29
ADMINISTRATIVE EVENT LOG



.....



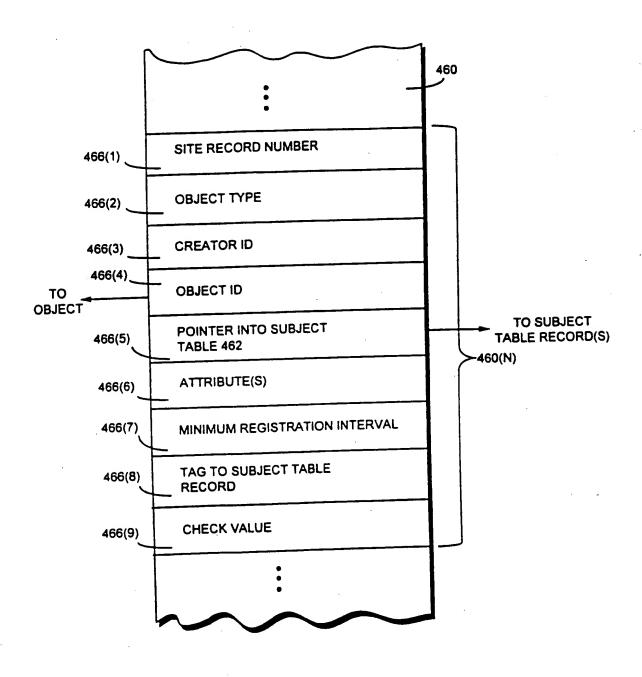
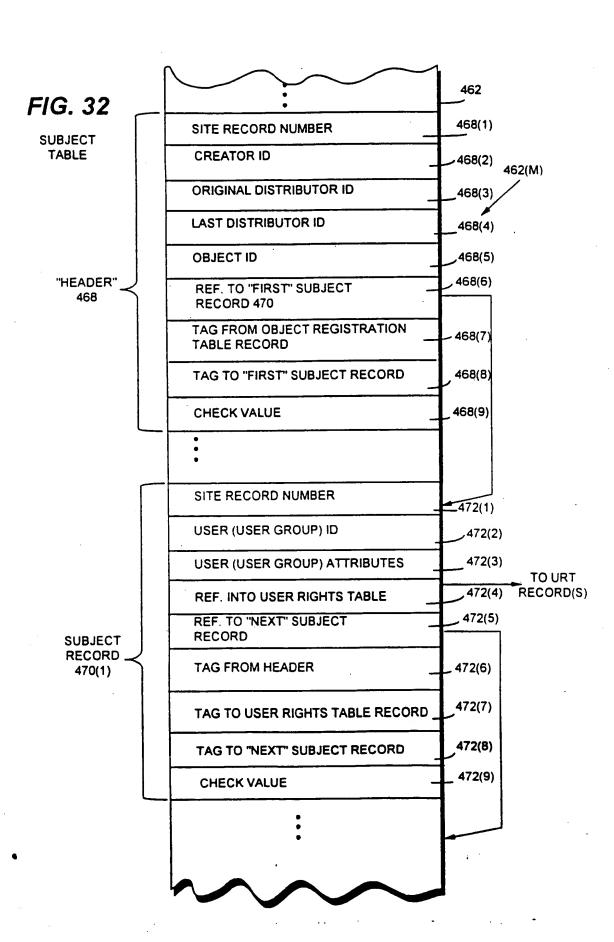
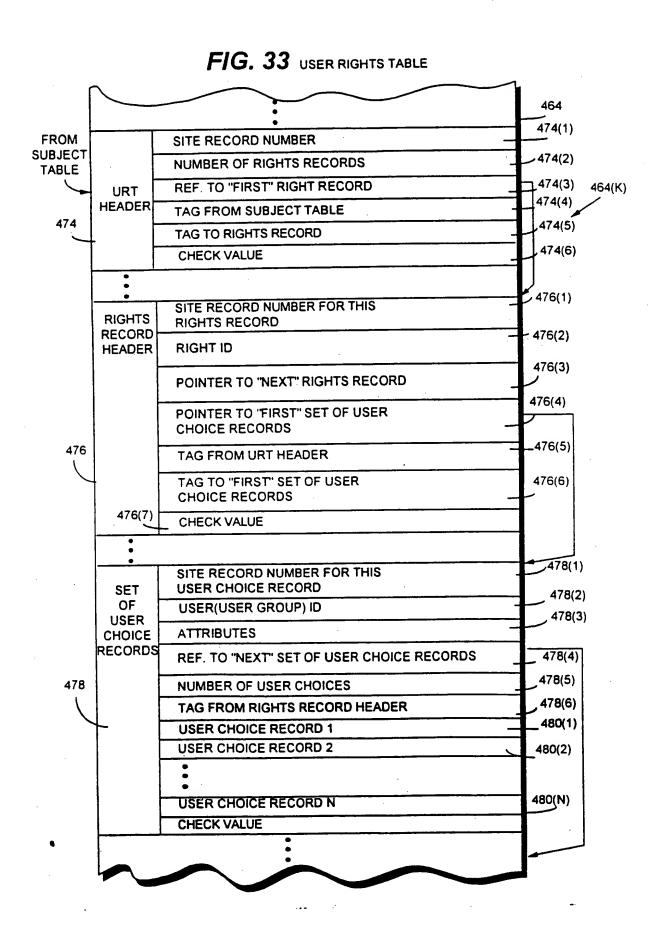
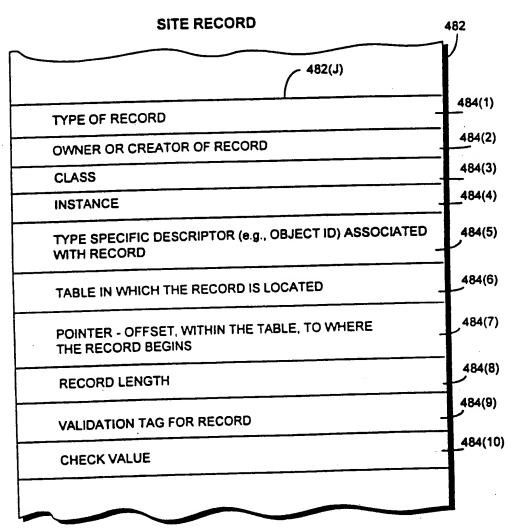


FIG. 31
OBJECT REGISTRATION TABLE

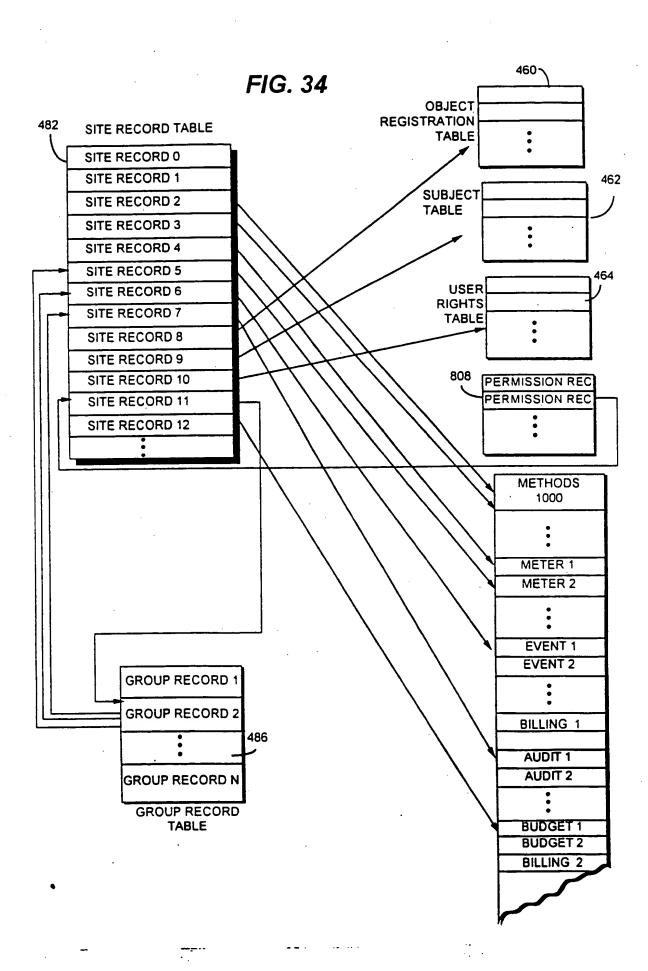




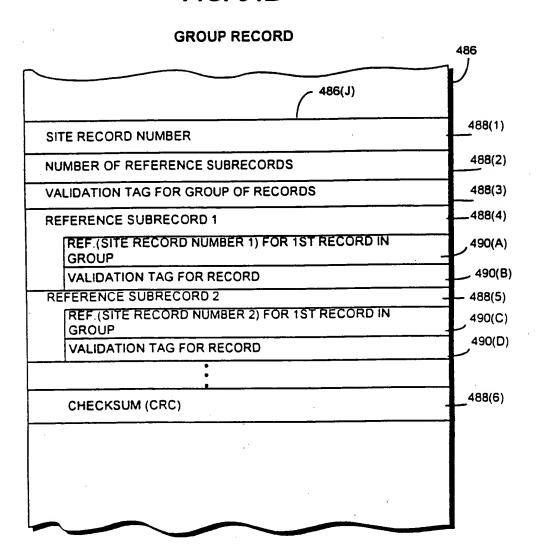


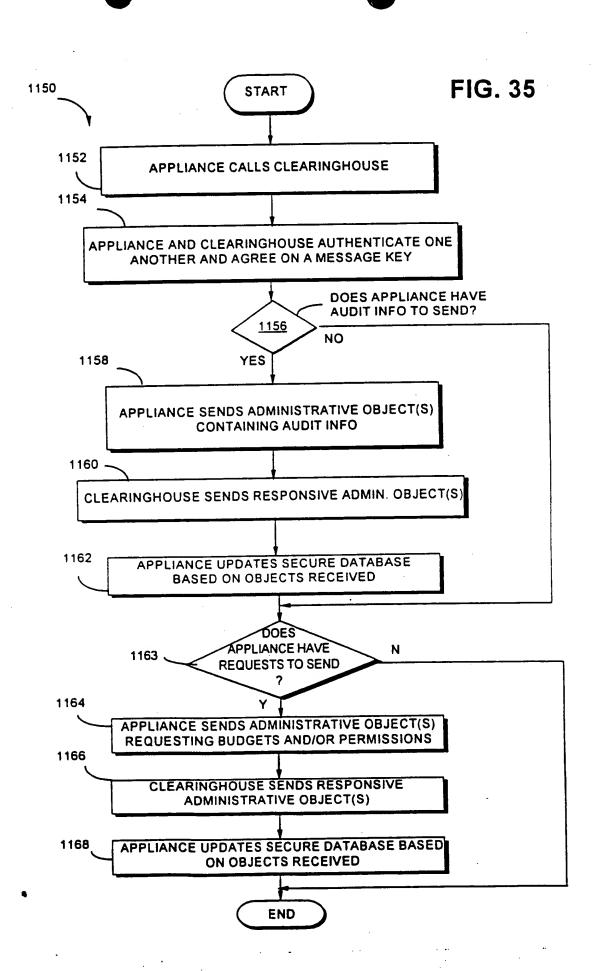


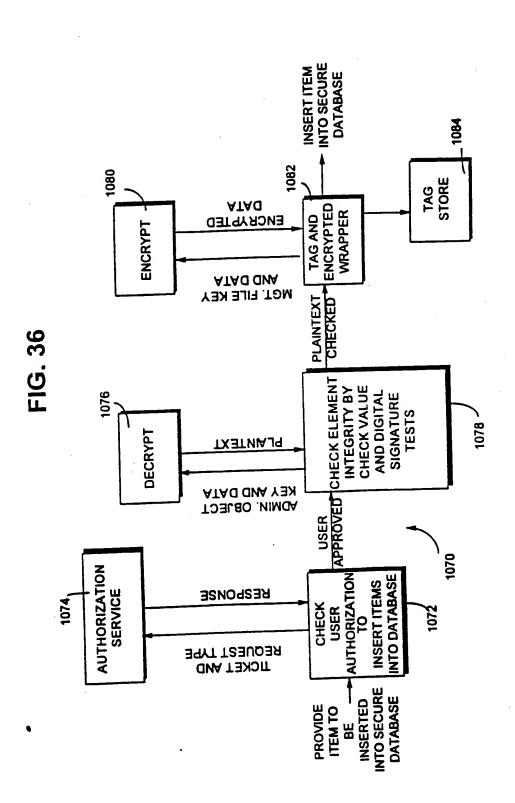
e : : :











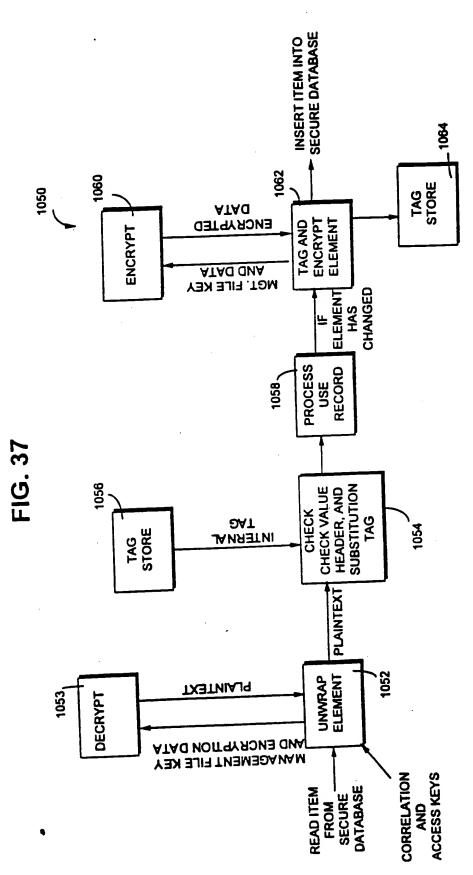
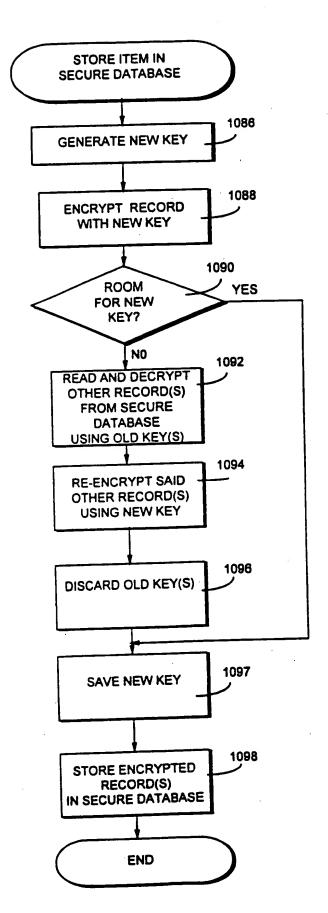
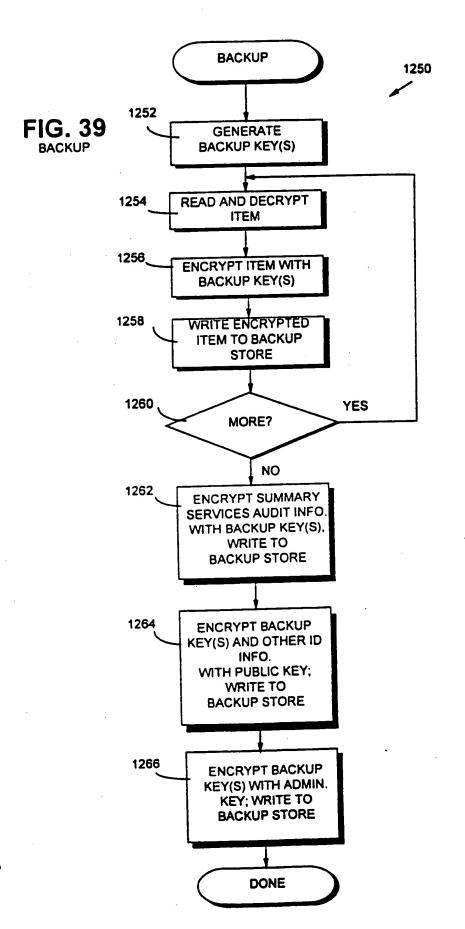


FIG. 38





4.50

 $\mathbf{x}_{i}^{*} = \mathbf{x}_{i}^{*}$ 

FIG. 40

RECOVER SECURE DATABASE

1268

START 1270 **ESTABLISH** SECURE COMMUNICATIONS 1272 **EXTRACT** "WORK IN PROGRESS" AND SUMMARY VALUES 1274 REQUEST CURRENT **BACKUP FROM SPU** 1276 **RESET SUMMARY** VALUES AND COUNTERS CONSISTENT WITH LAST **BACKUP** 1278 RESTORE SECURE DB FROM BACKUP 1280 COMPUTE BILLS BASED ON RECOVERED **VALUES** 1282 PERFORM OTHER ACTIONS TO RECOVER FROM SPU DOWNTIME **END** 

\* \*\* ..

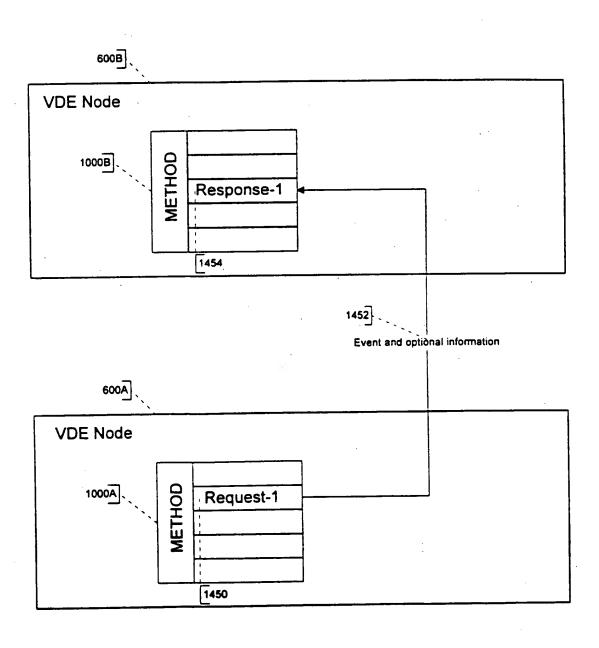


Figure 41a

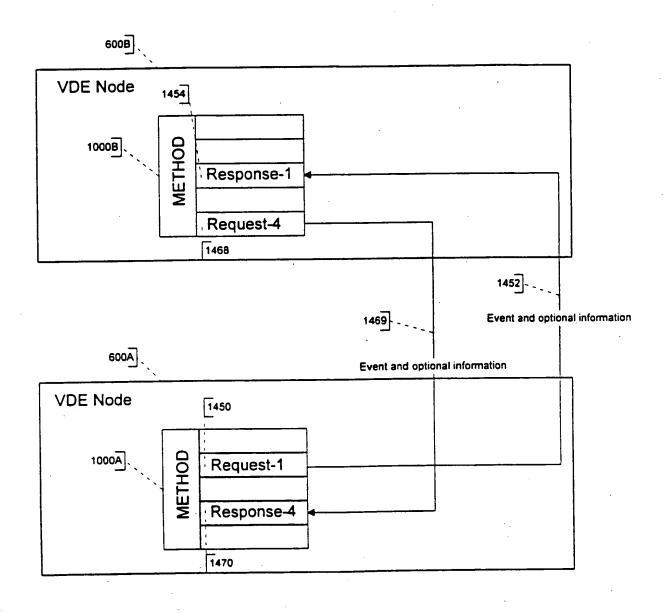


Figure 41b

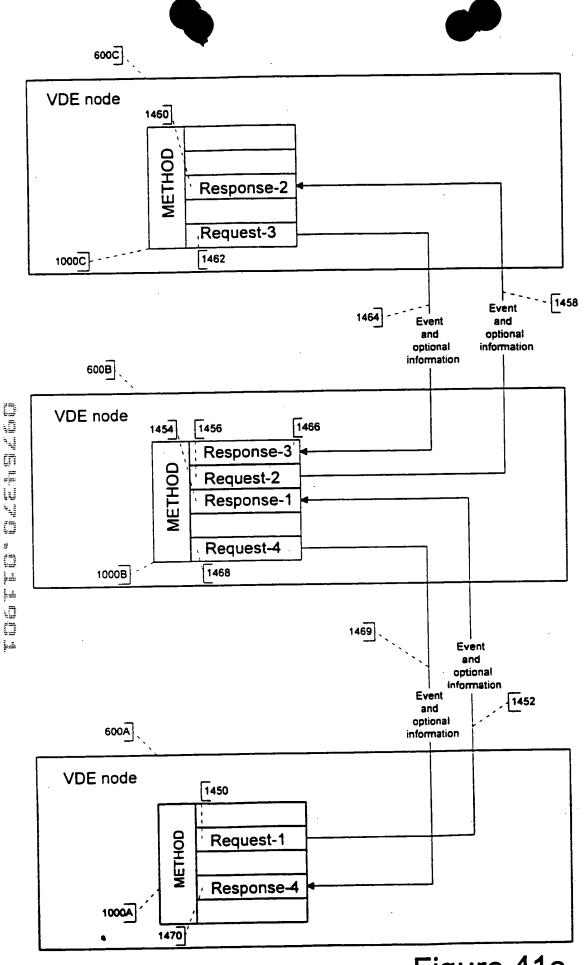


Figure 41c

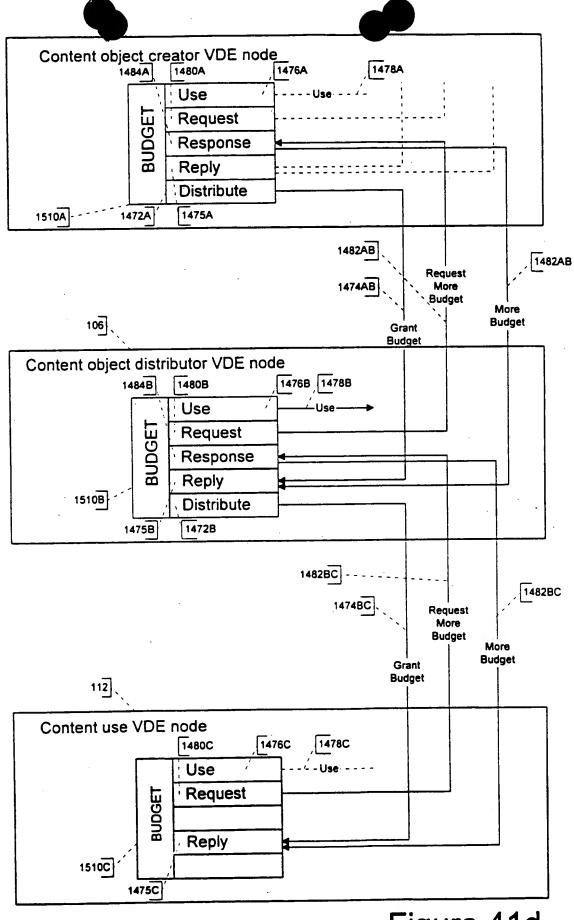
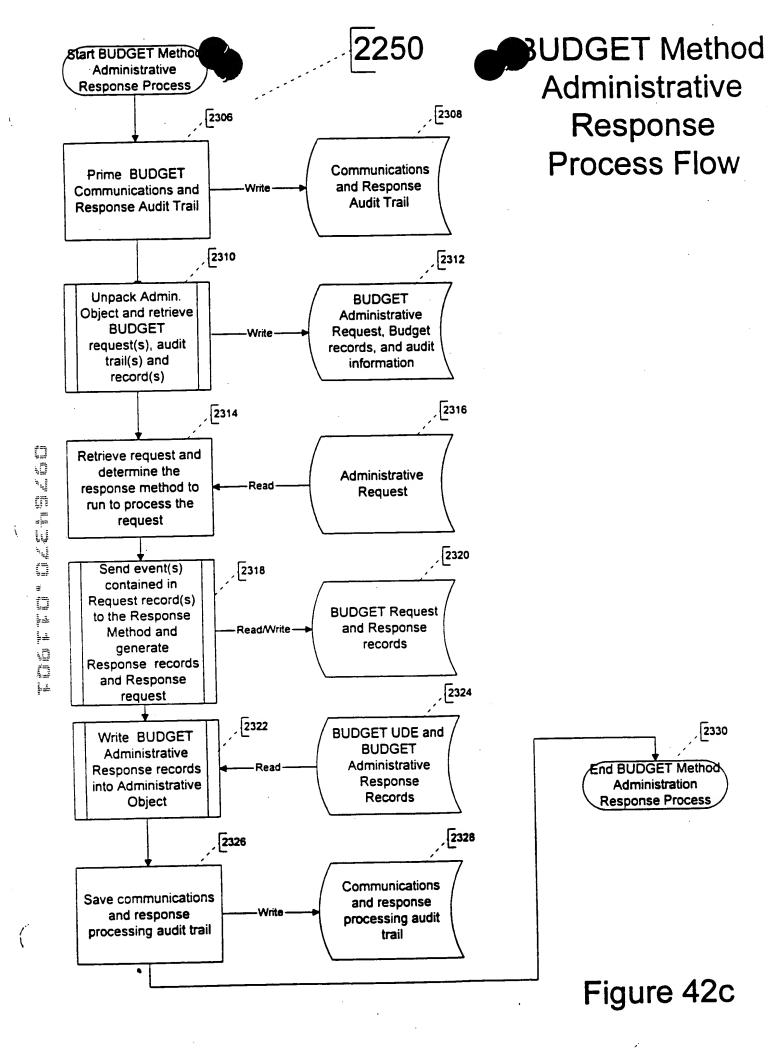


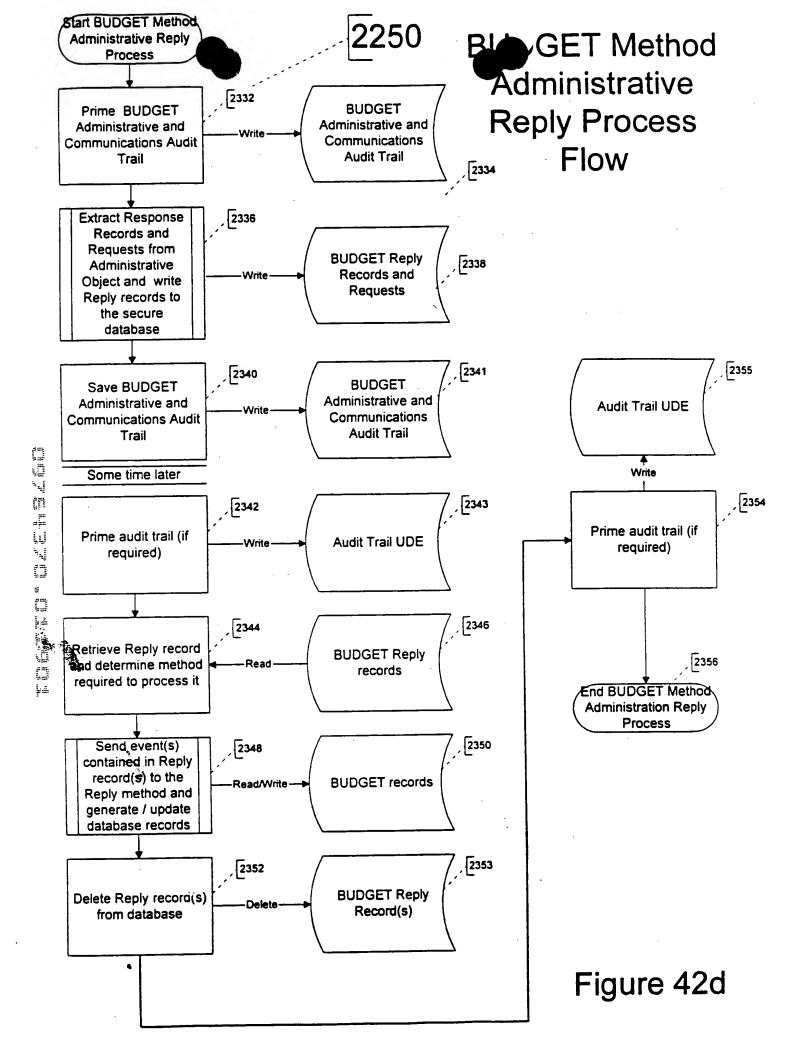
Figure 41d

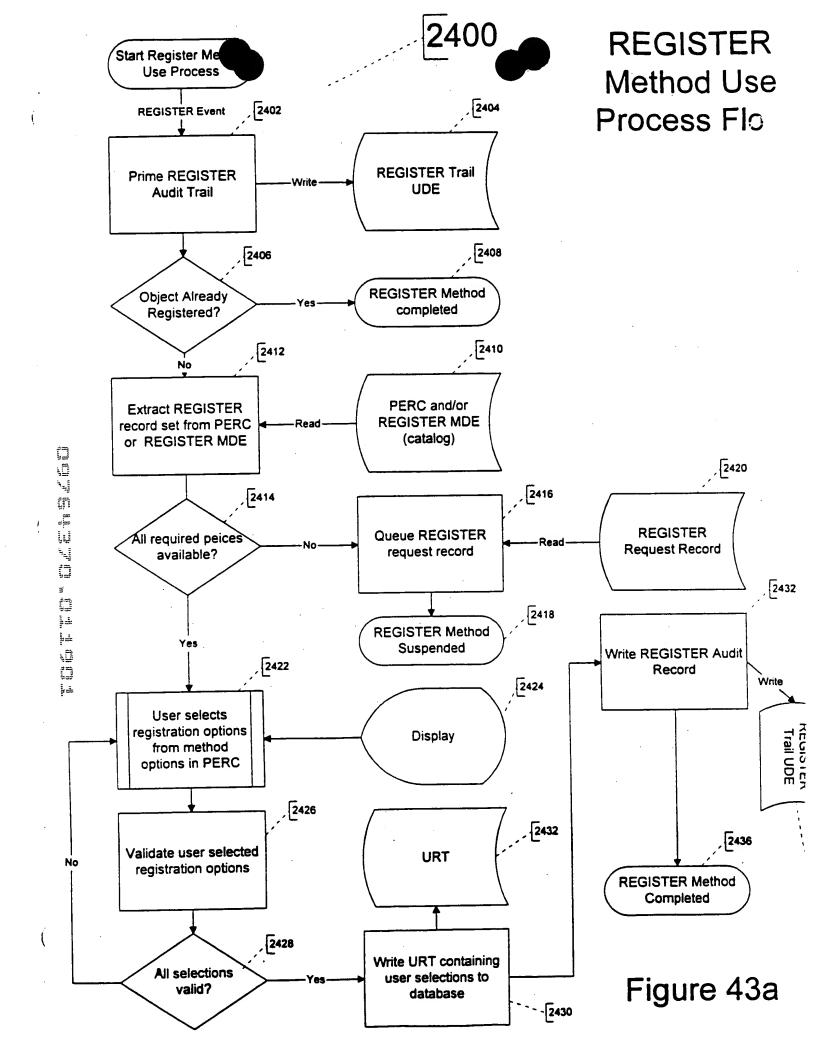
The transfer of the state of th

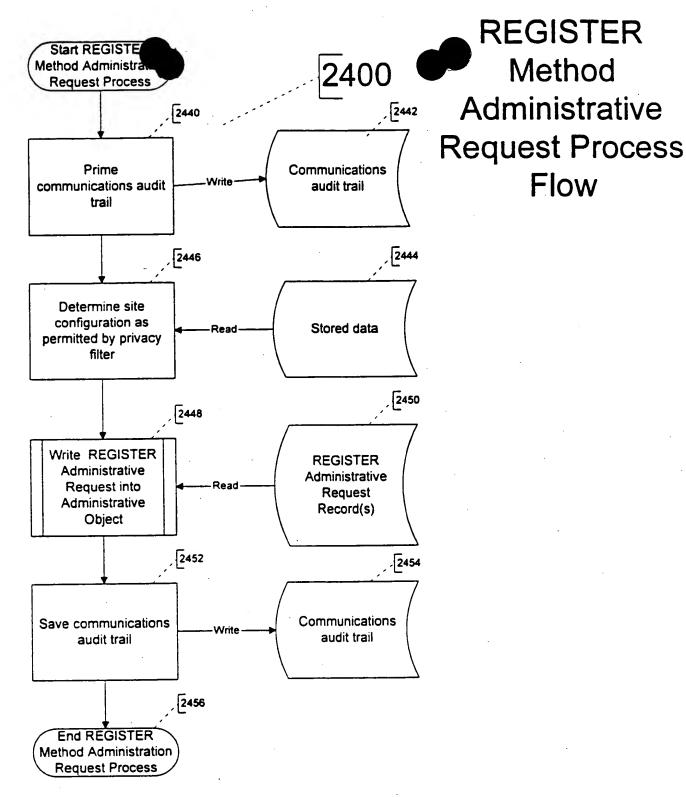
4-4

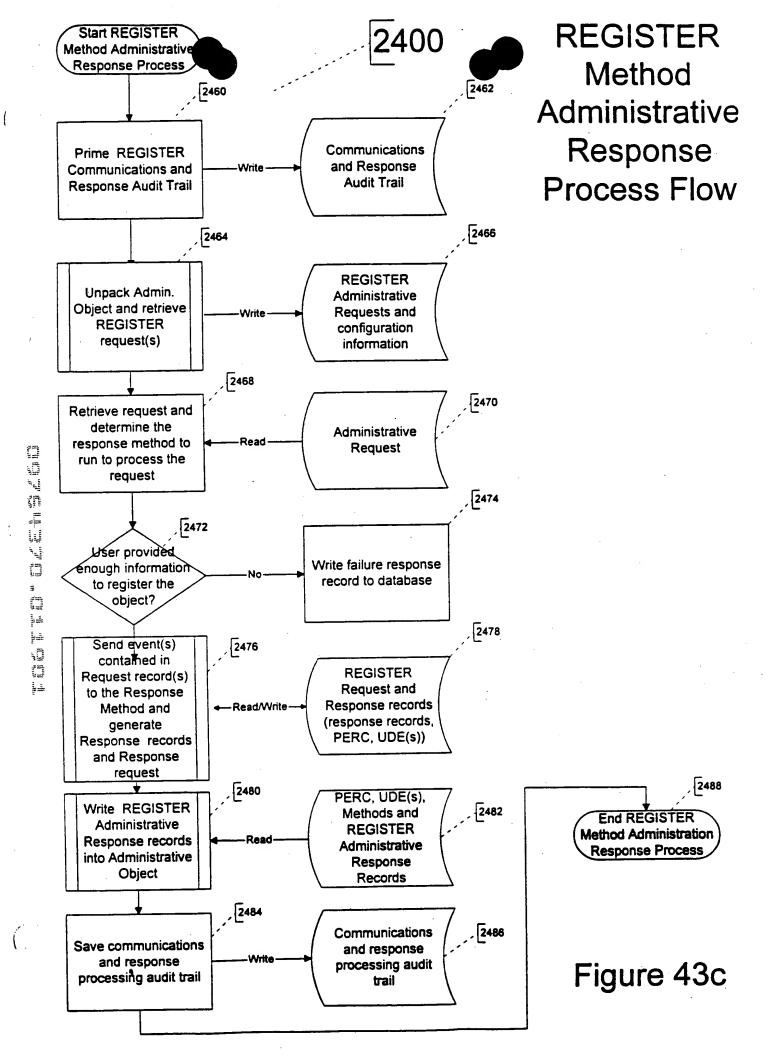
 10 10

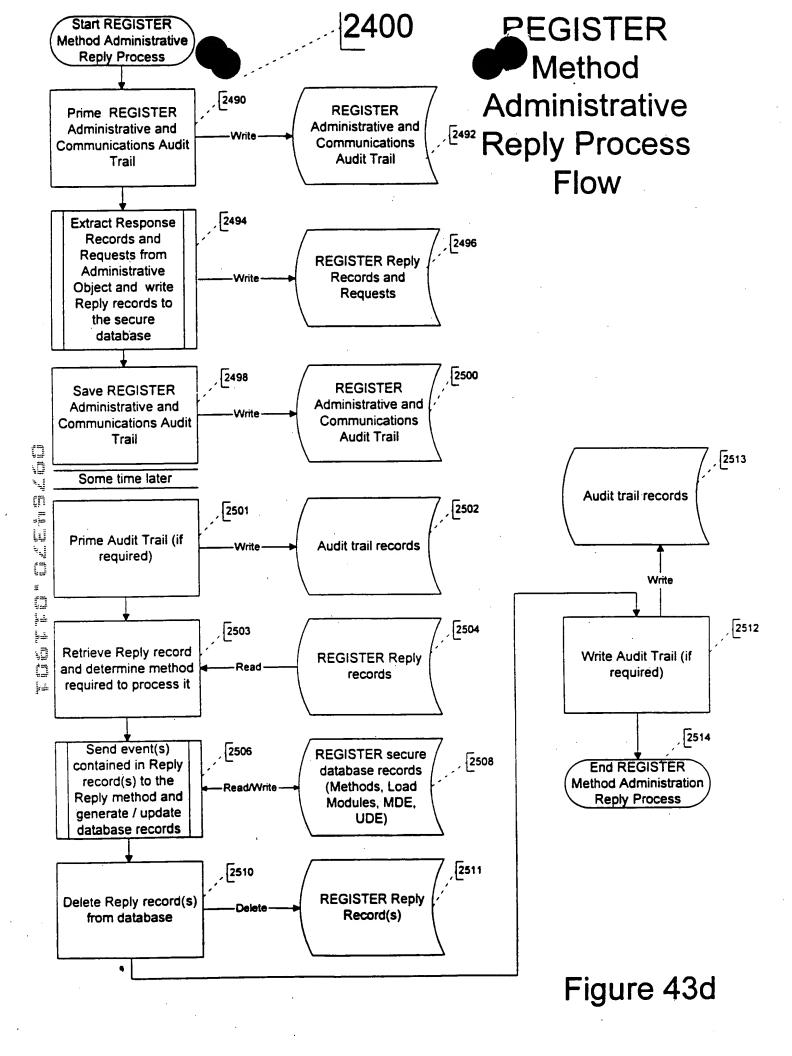




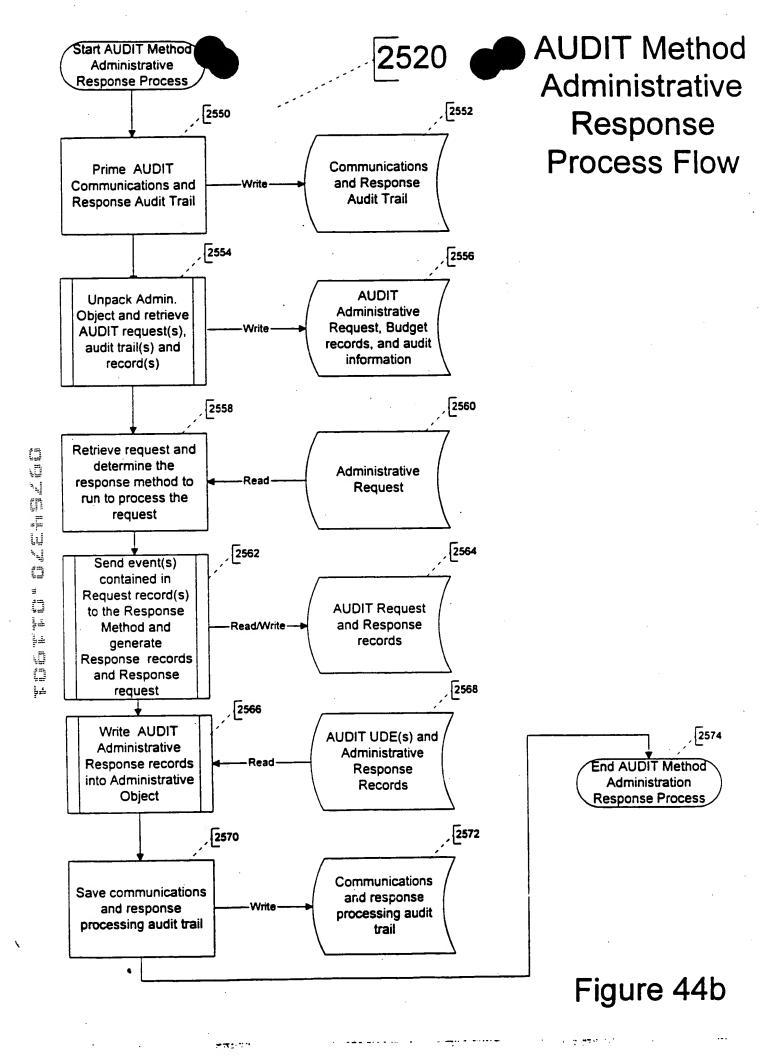


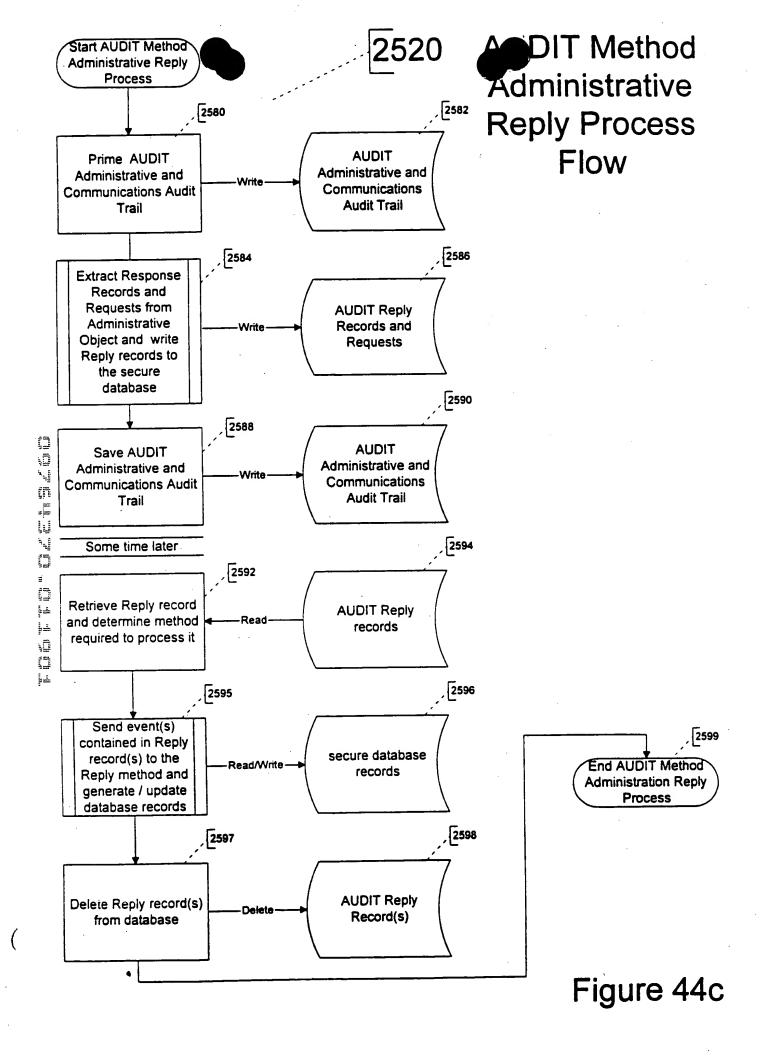


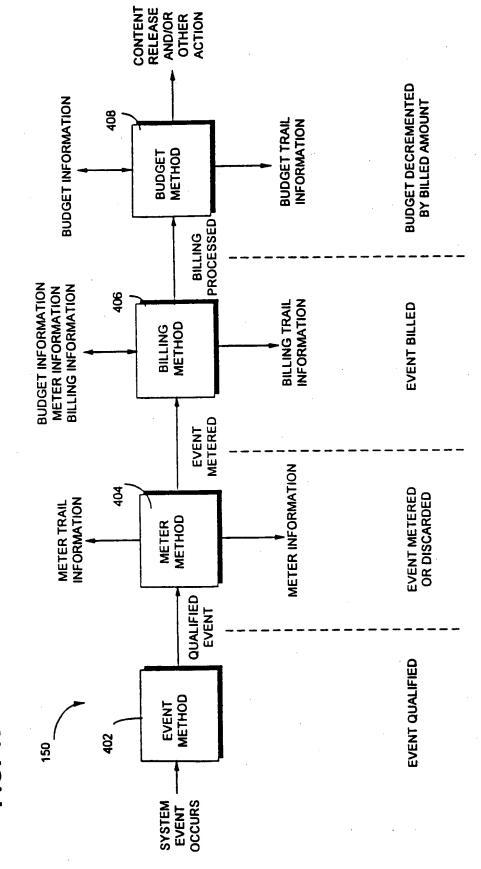




j

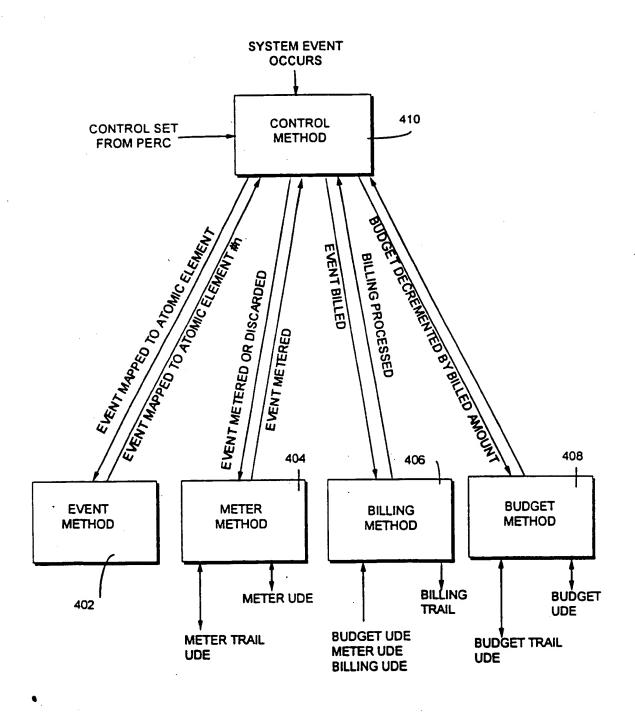


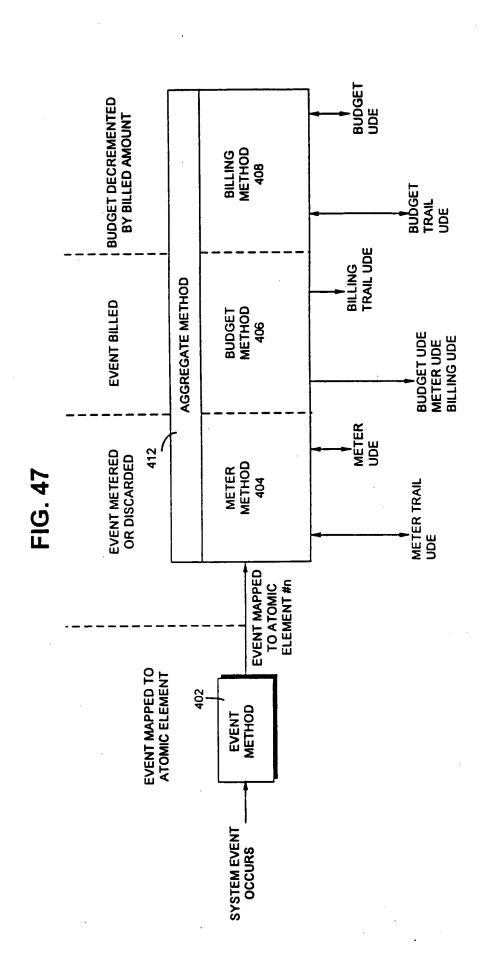


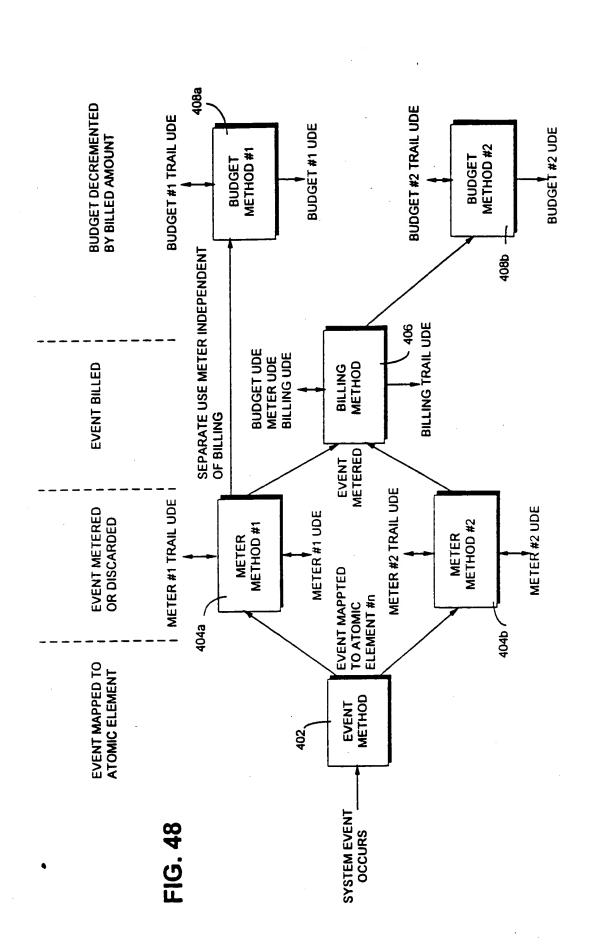


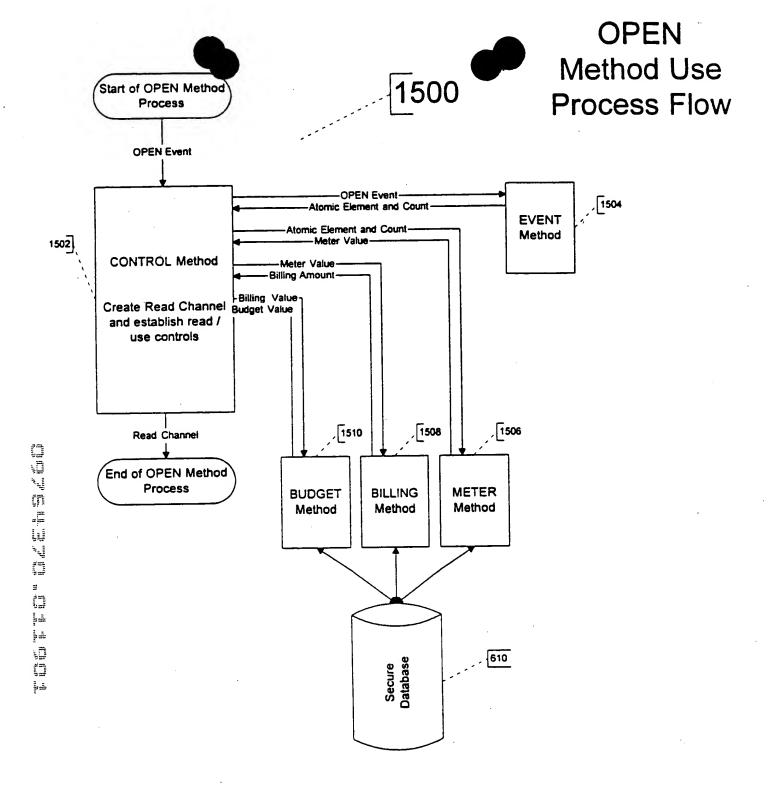
**F**IG. 45

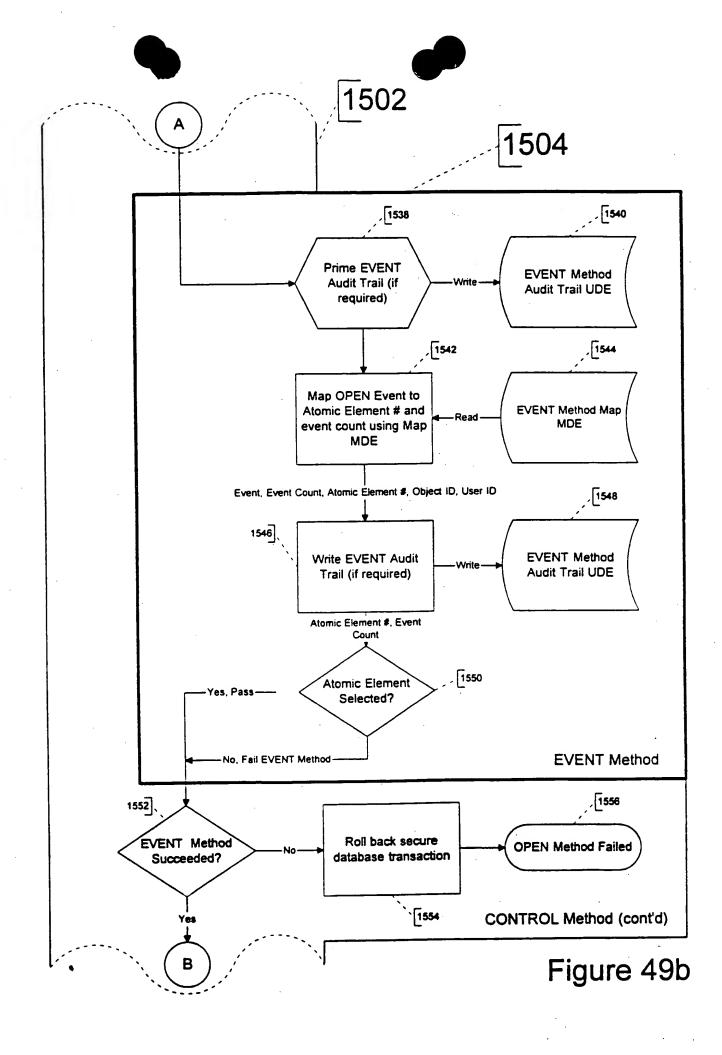
FIG. 46

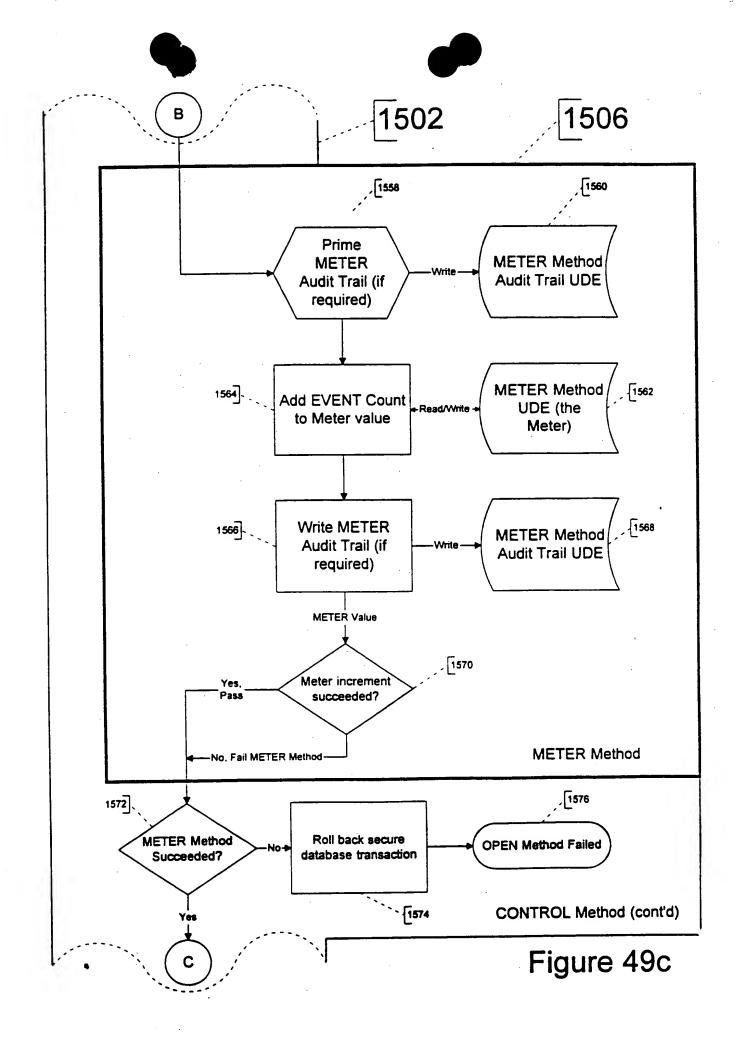




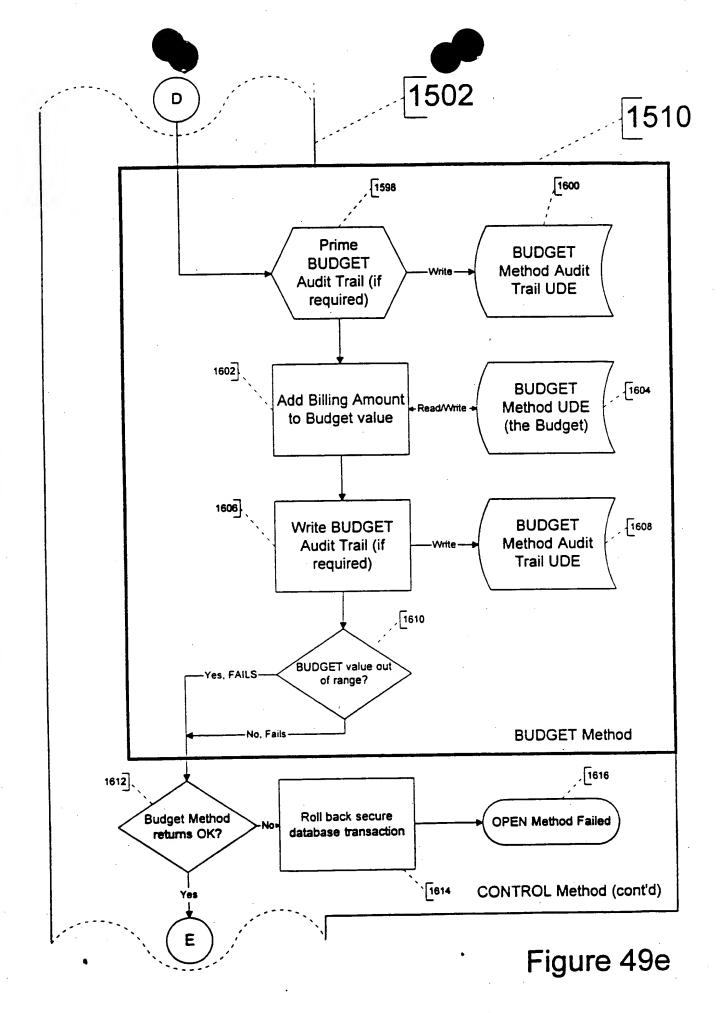








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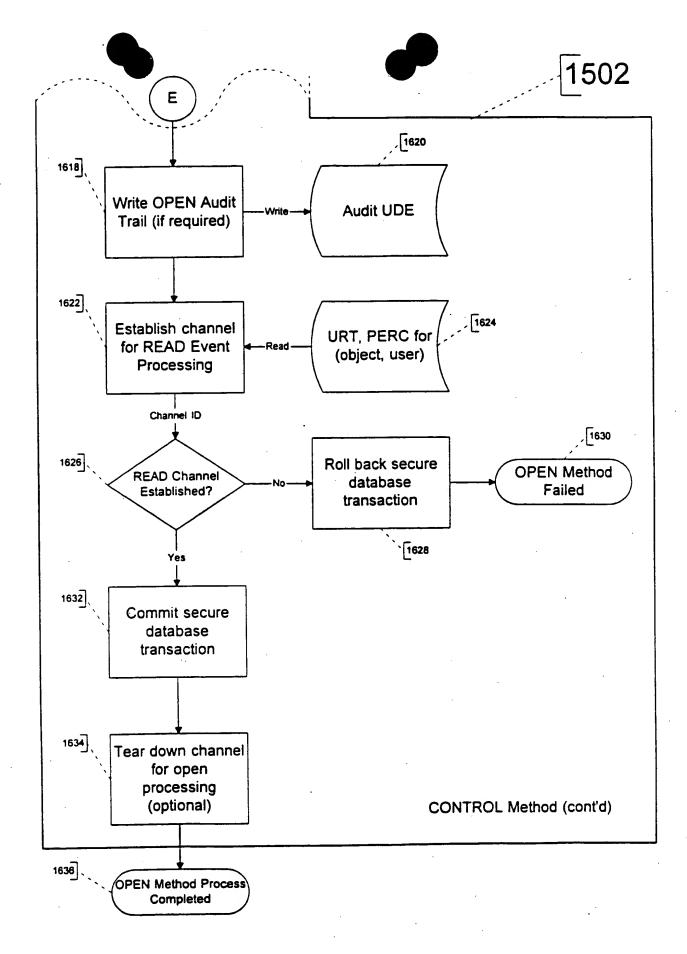
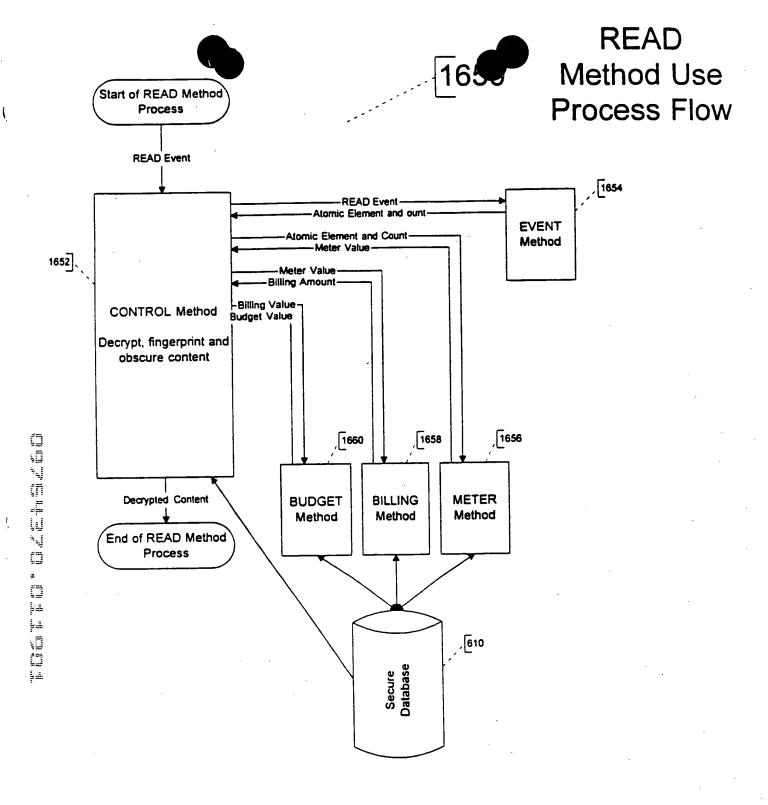
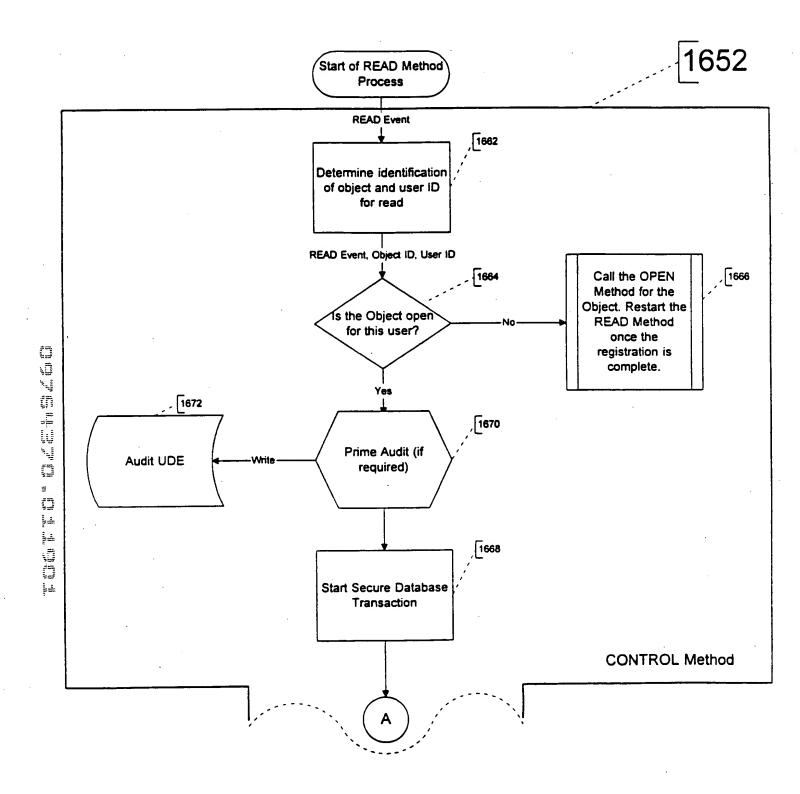
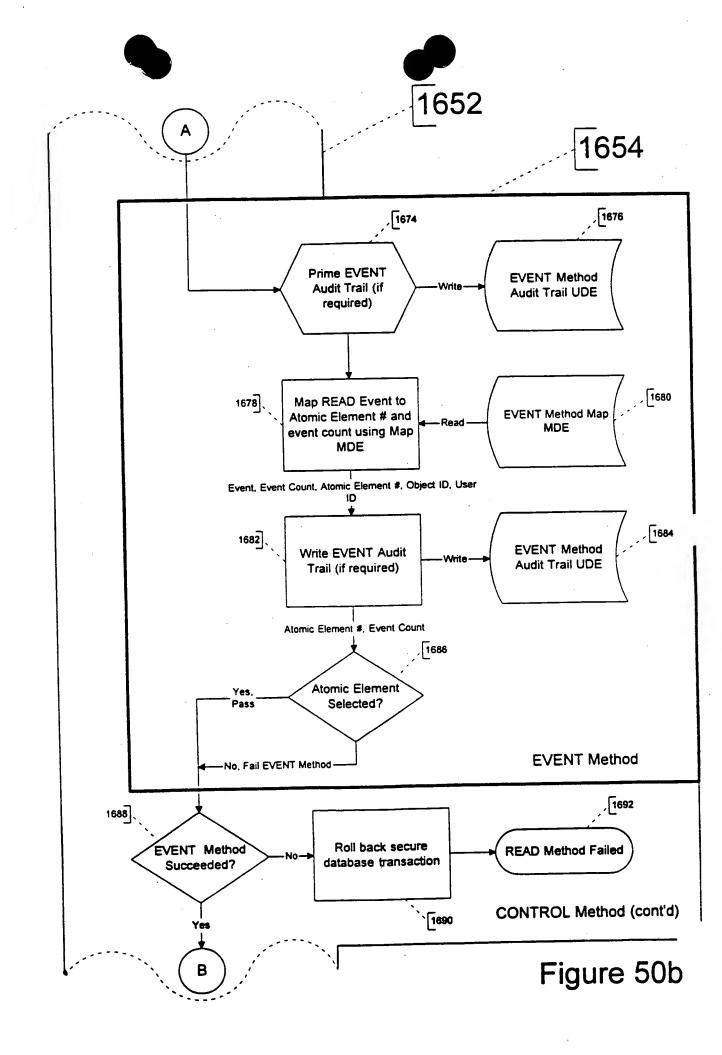


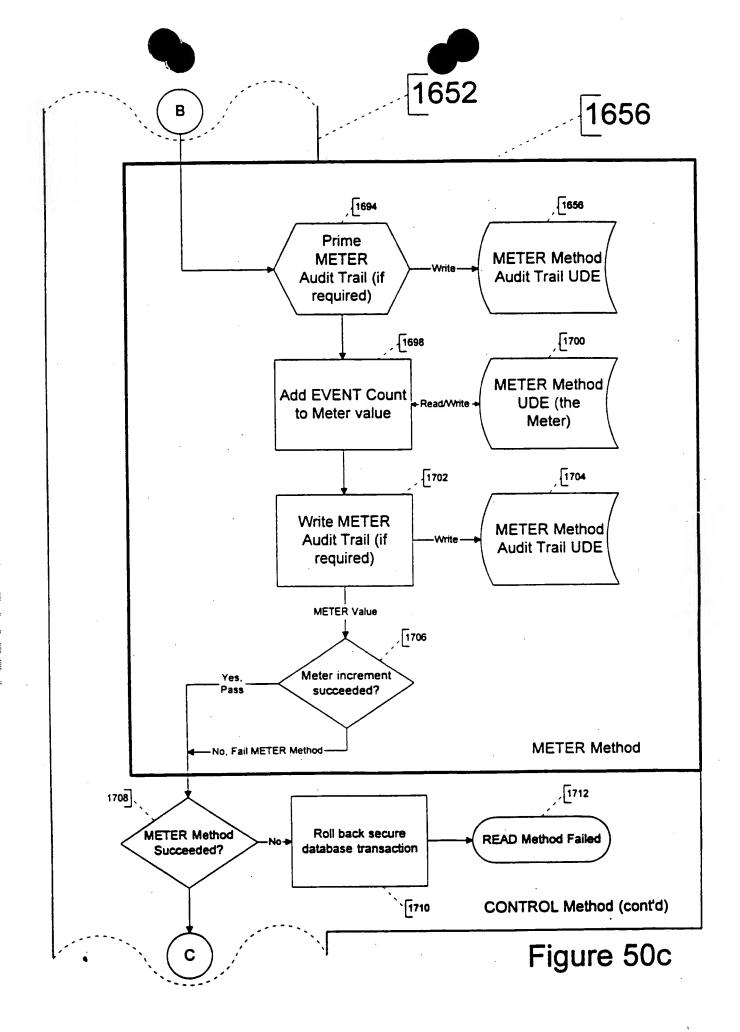
Figure 49f

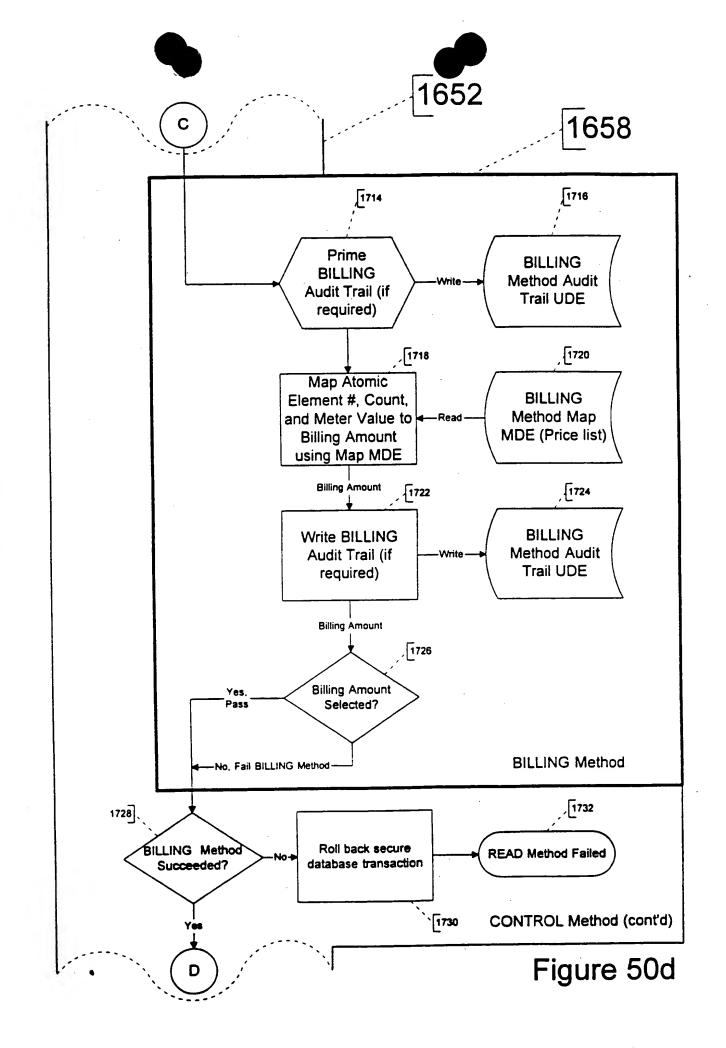


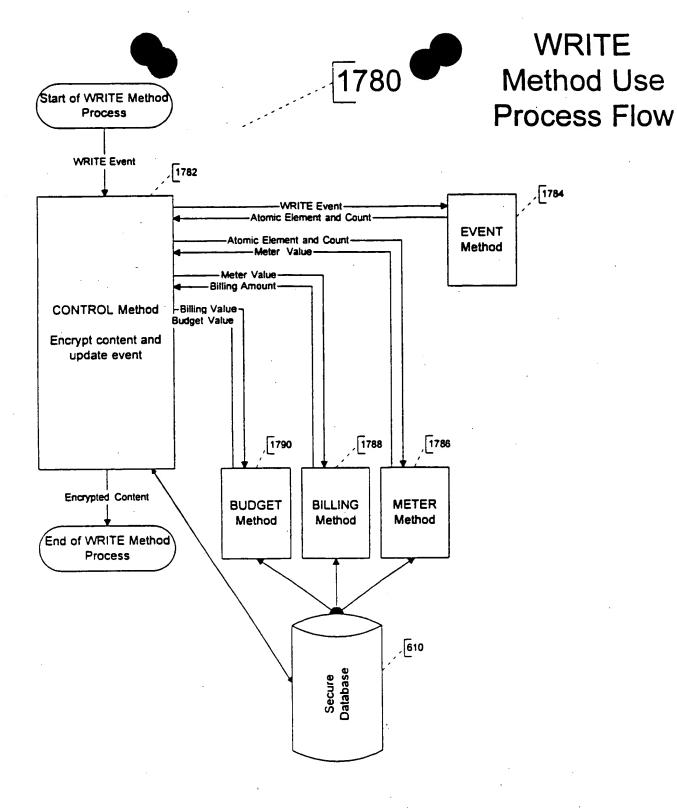








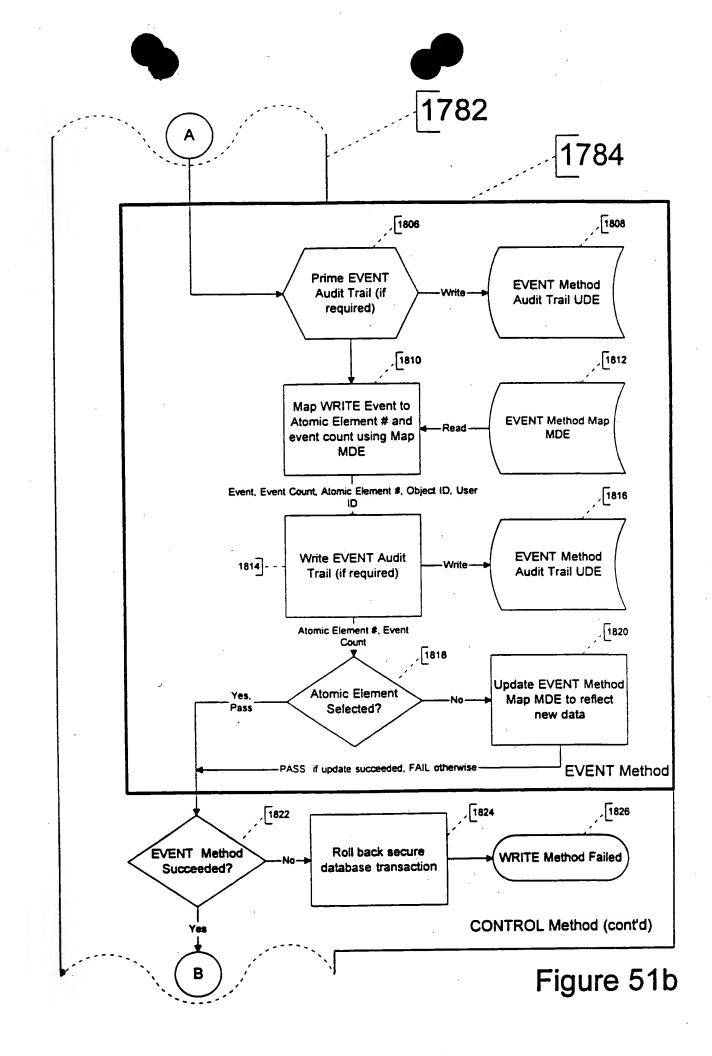




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Figure 51a



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CLOSE Method Process Flow

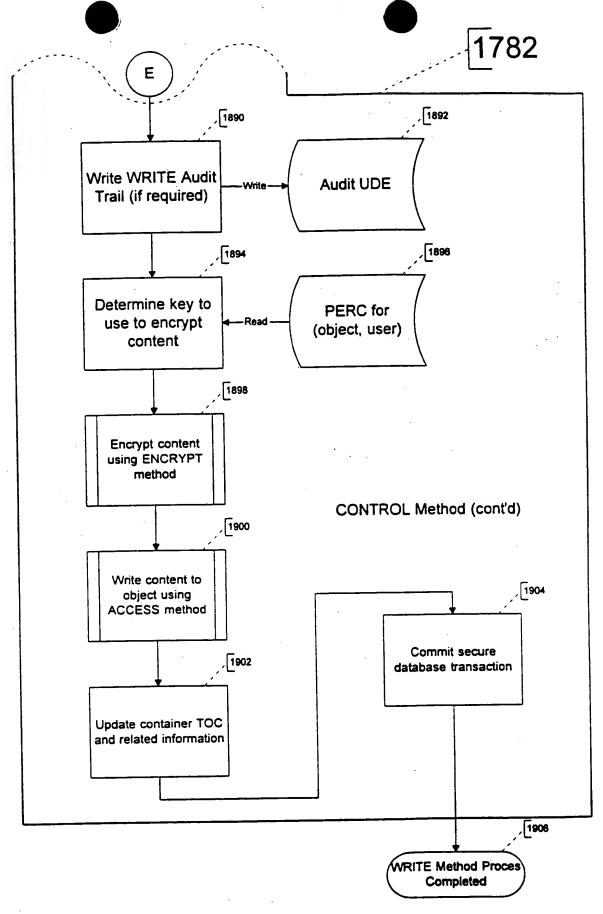
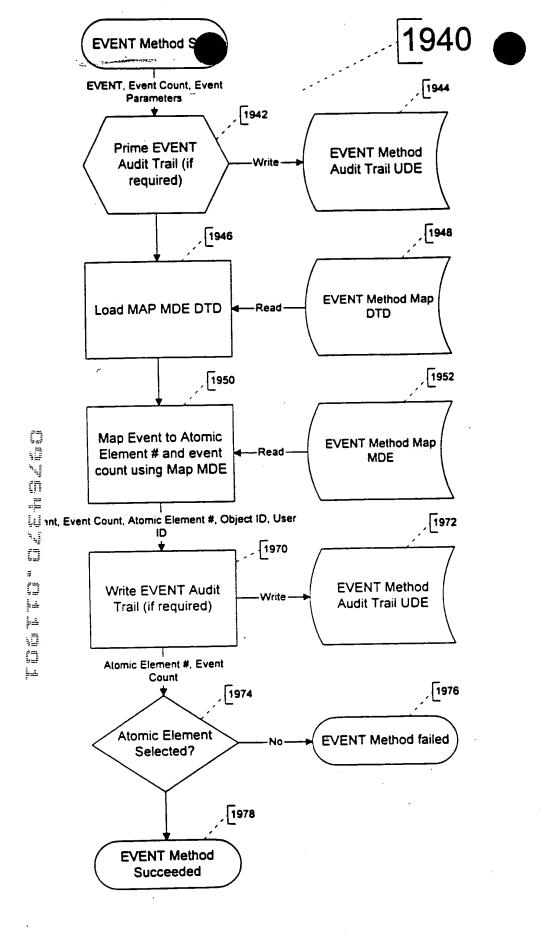


Figure 51f

Sample EVENT Method Mapping Process

. :-:-



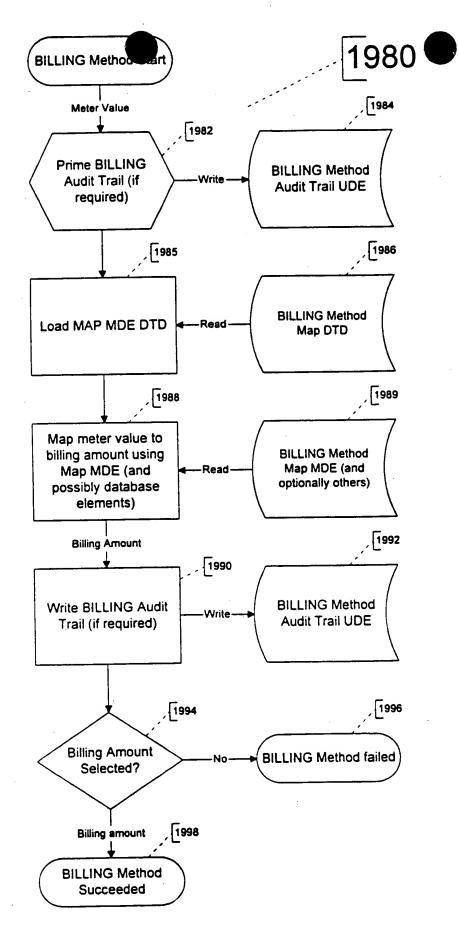
EVENT Method Process Flows

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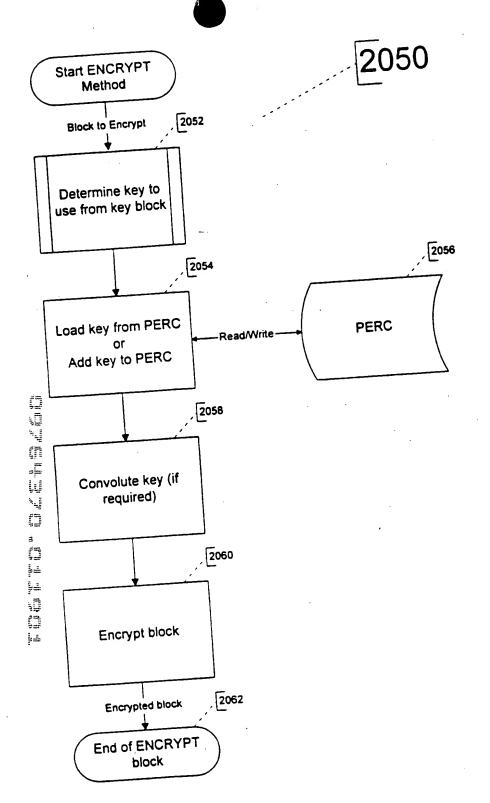
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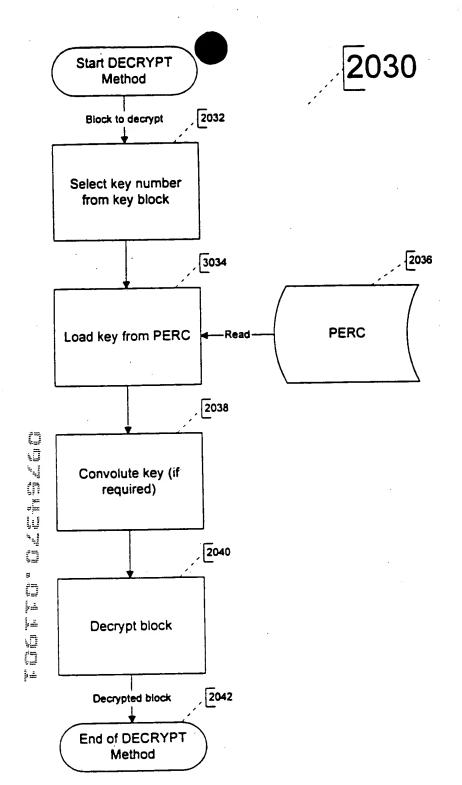
}±



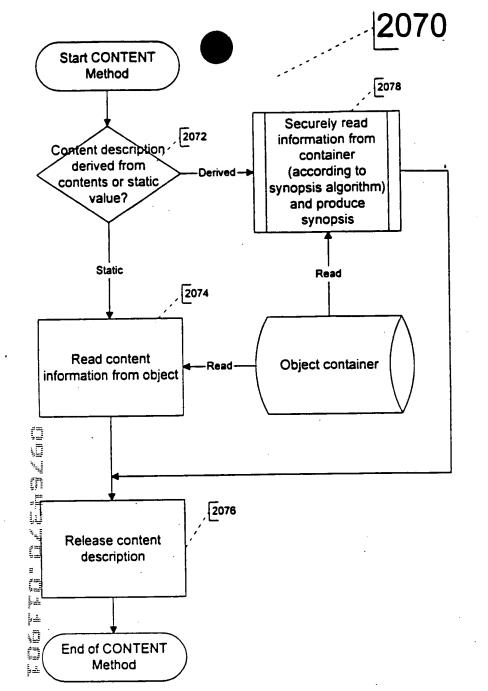
BILLING Method Process Flows



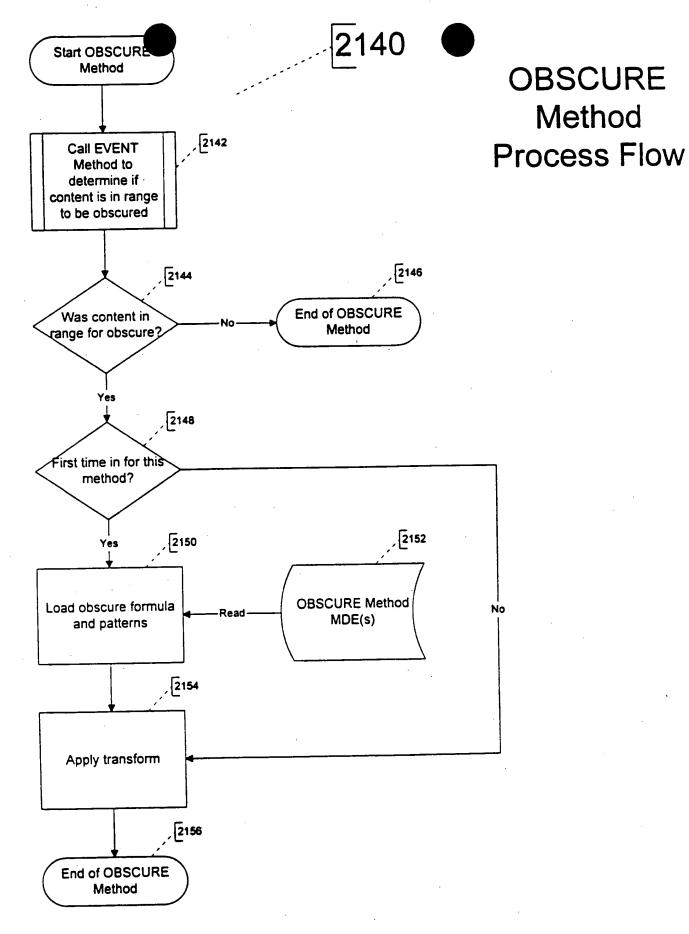
ENCRYPT
Method
Process Flow

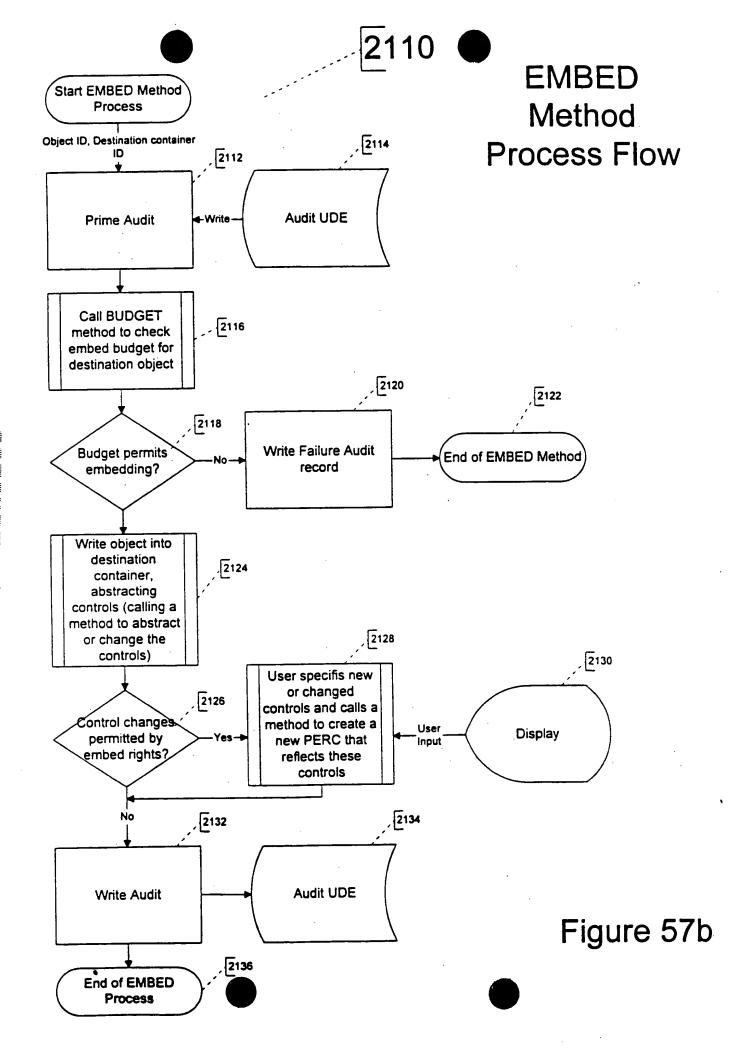


## DECRYPTMethodProcess Flow



## CONTENT Method Process Flow





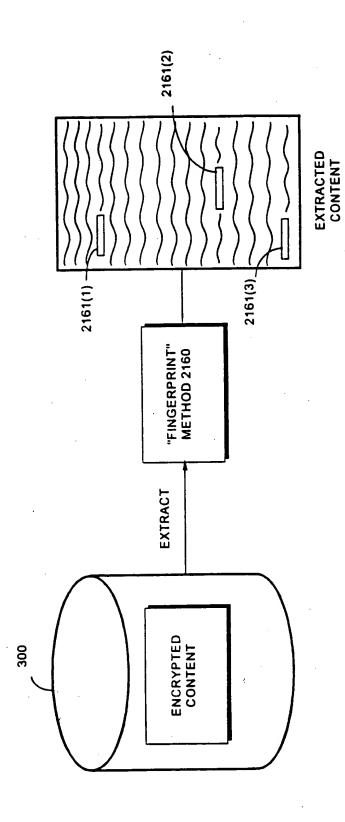
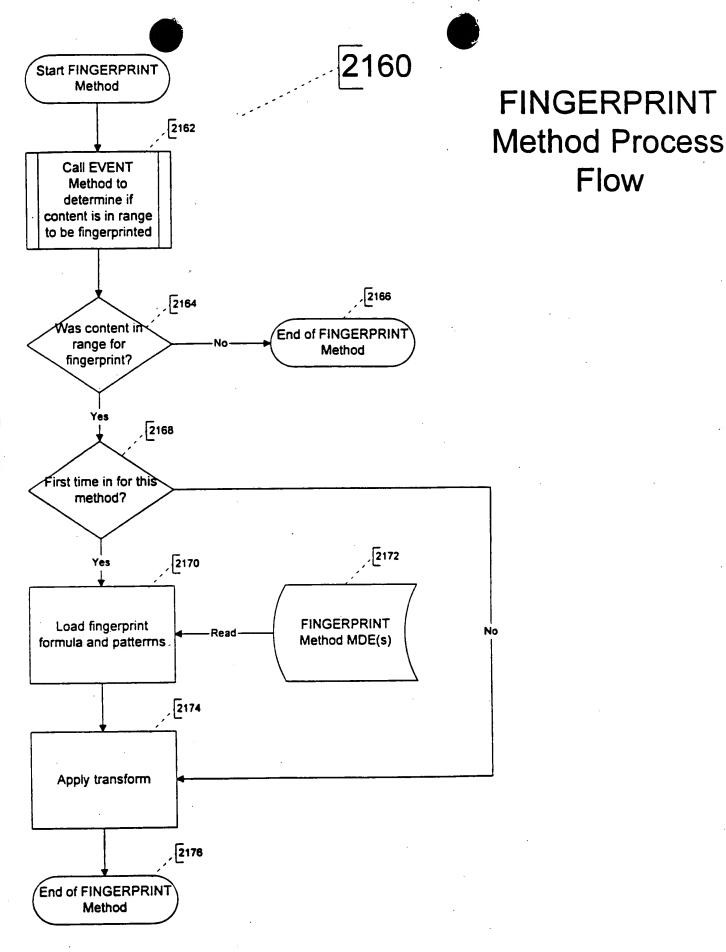
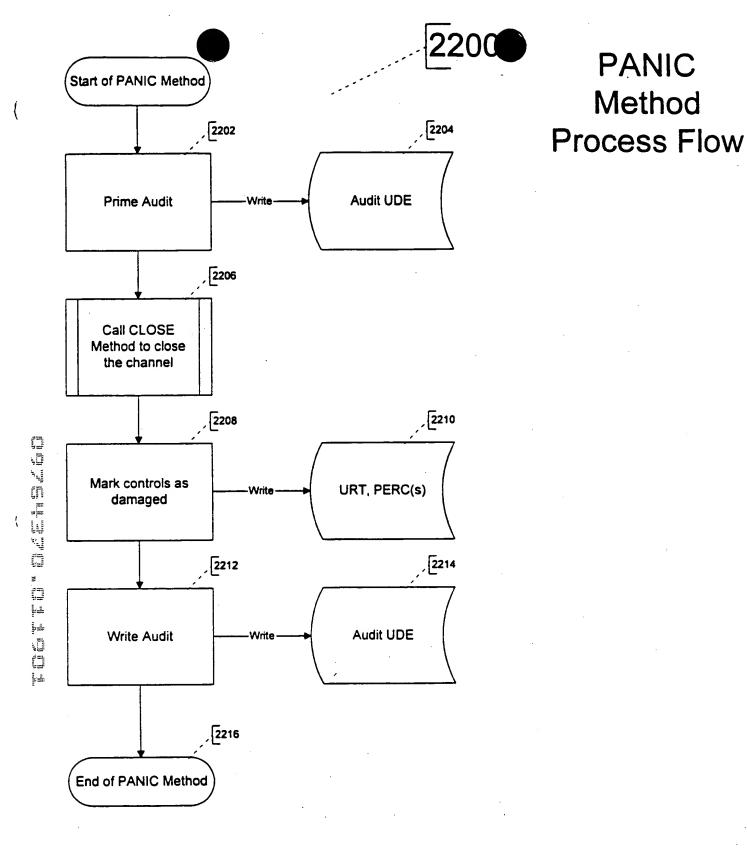


FIG. 58C



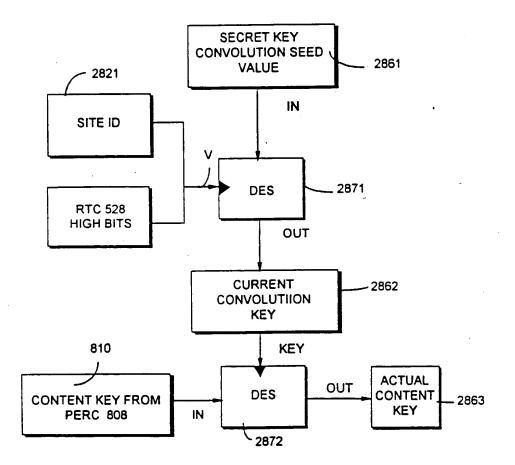


Flow



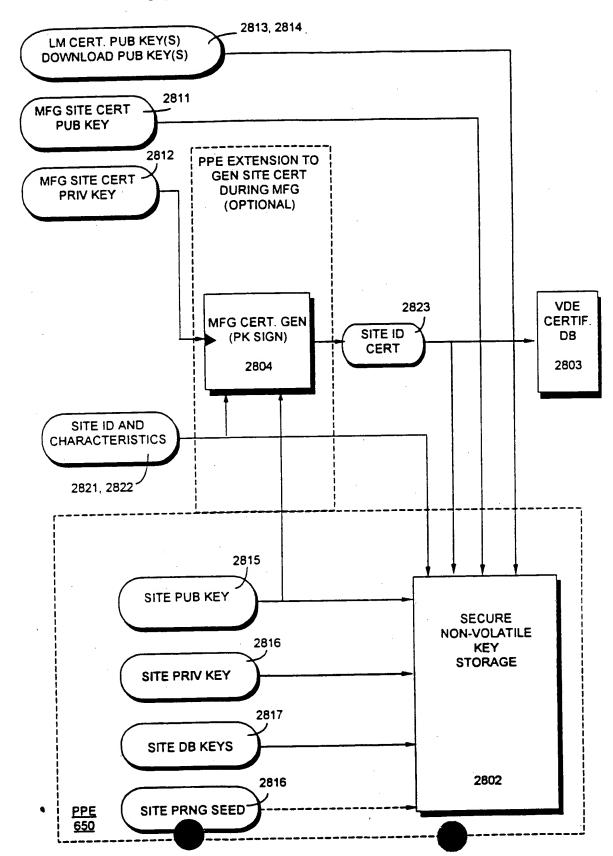
## DESTROY Method Process Flow

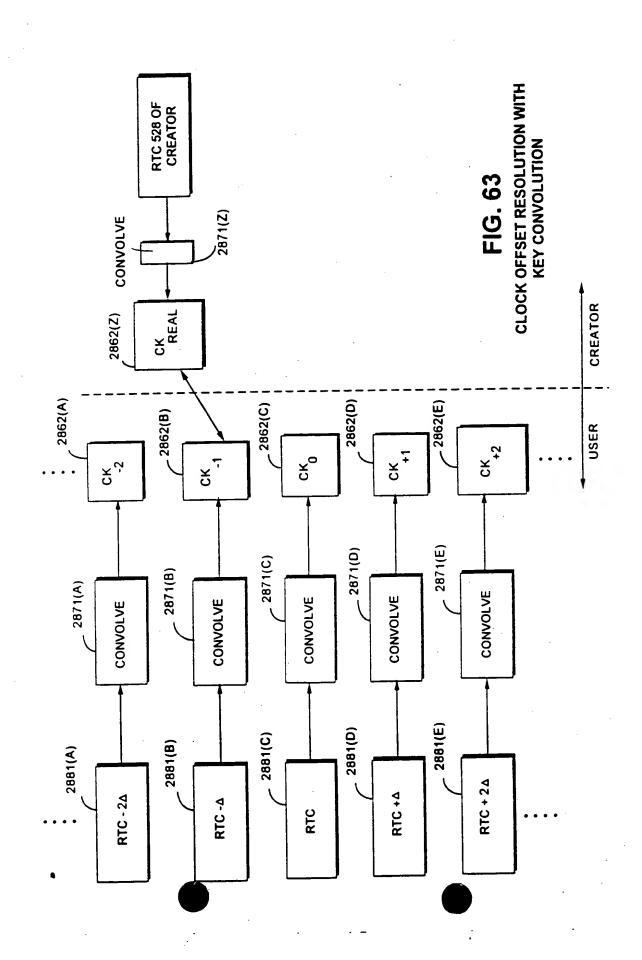
FIG. 62
KEY CONVOLUTION PROCESS



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FIG. 64 SPU KEY INITIALIZATION/INSTALLATION





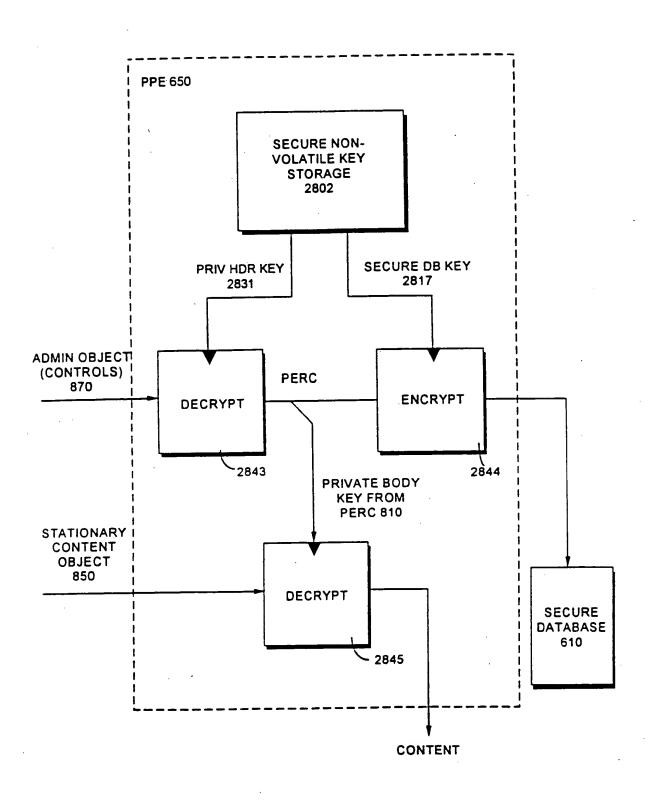
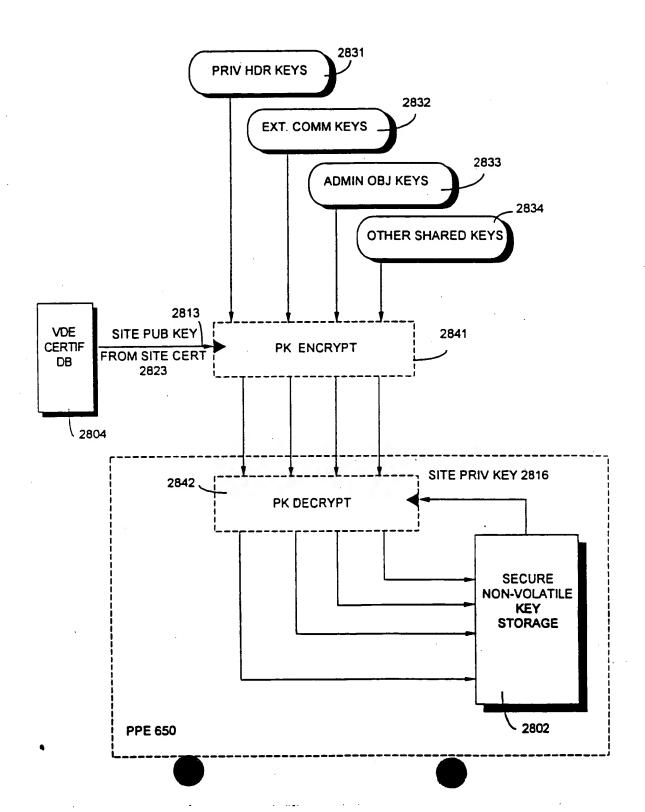
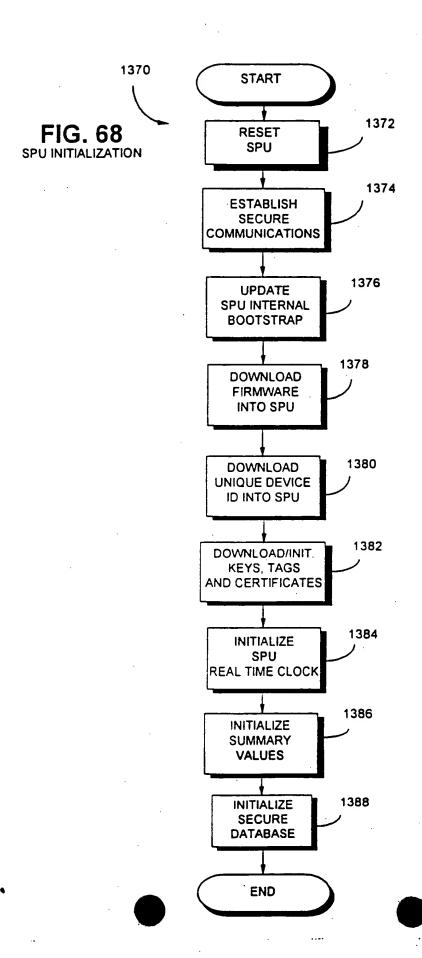


FIG. 66 STATIONARY OBJECT DECRYPTION

FIG. 65 KEY INSTALLATION & UPDATE





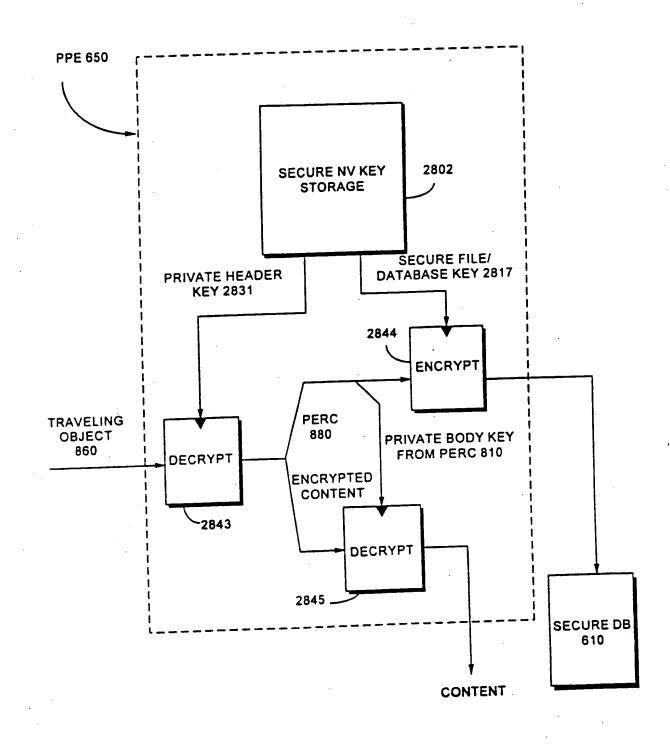


FIG. 67 TRAVELING OBJECT DECRYPTION

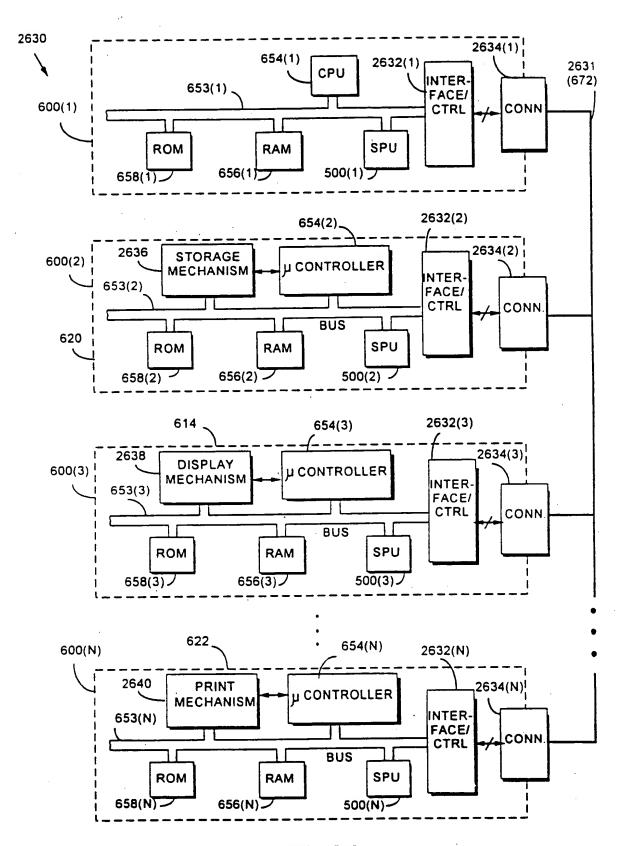
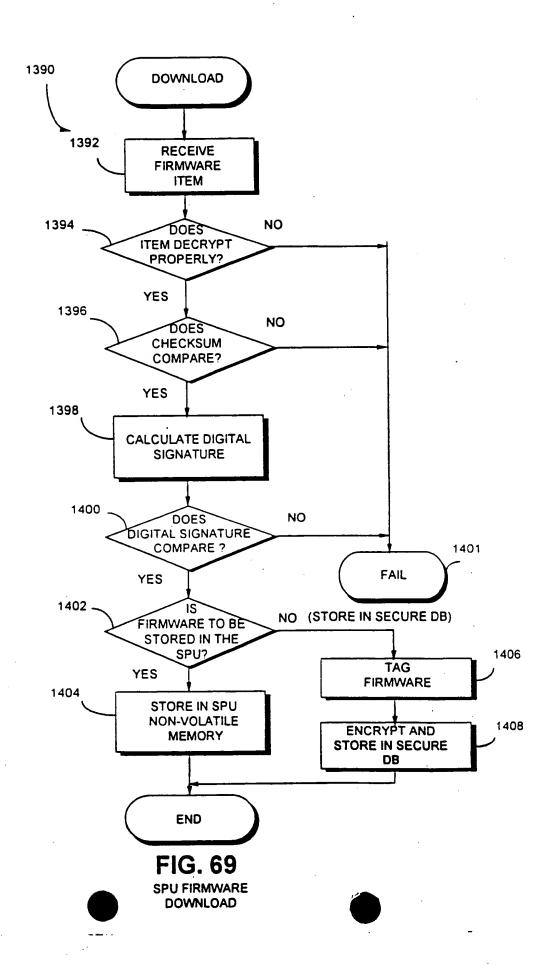


FIG. 70



LOG IN USER INTERFACE 18			2
USER NAME:	SHEAR, V.		LOGIN
PASSWORD:	* * * *		CANCEL
LOGIN AT STARTUP			HELP

FIG. 72A

FIG. 72B

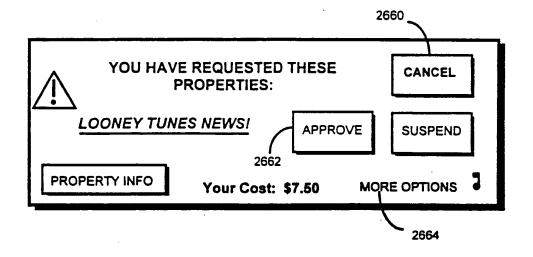
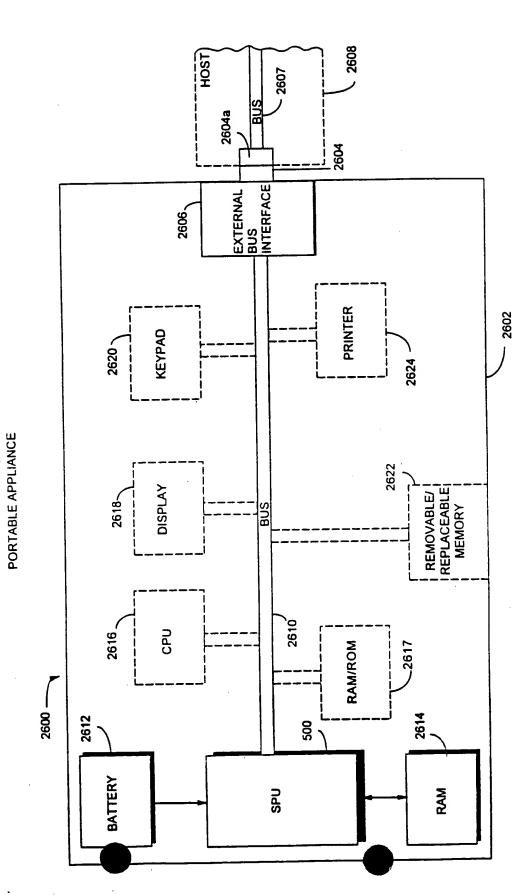


FIG. 71





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FIG. 72D

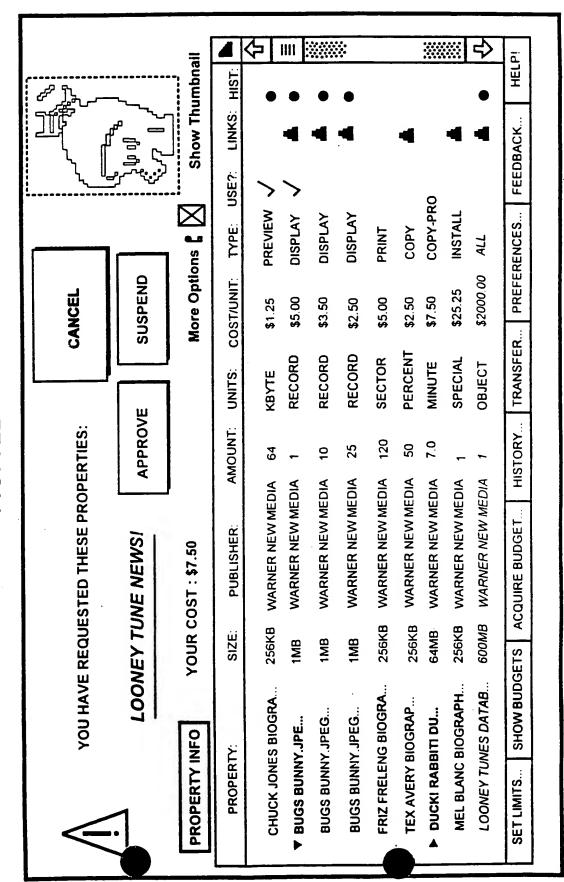


FIG. 72C

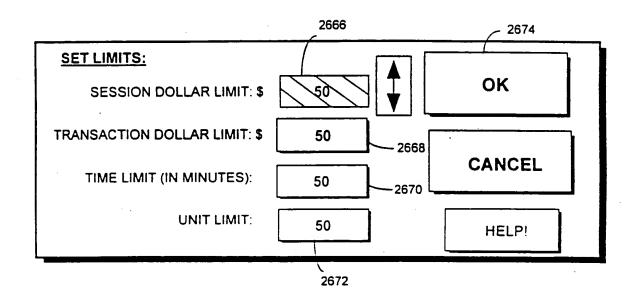
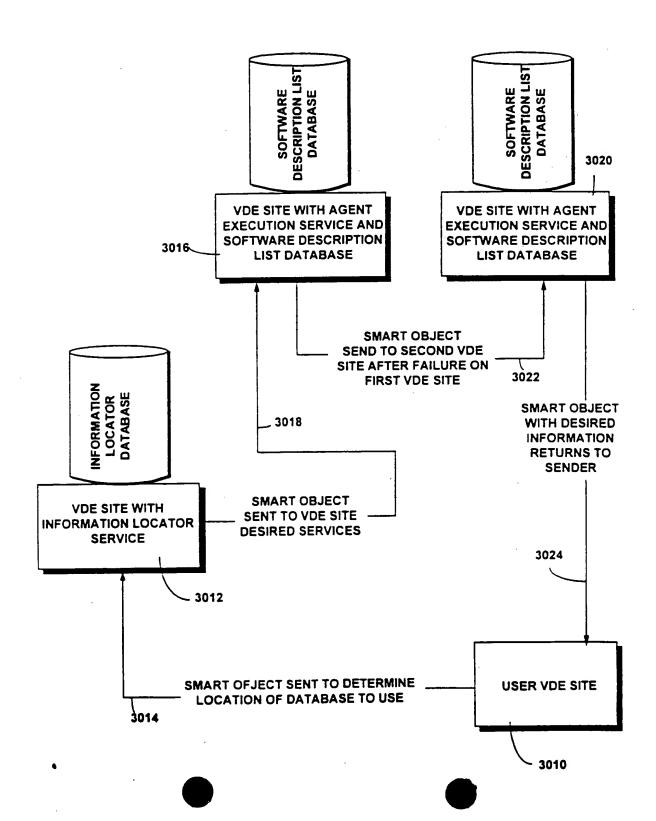


FIG. 74



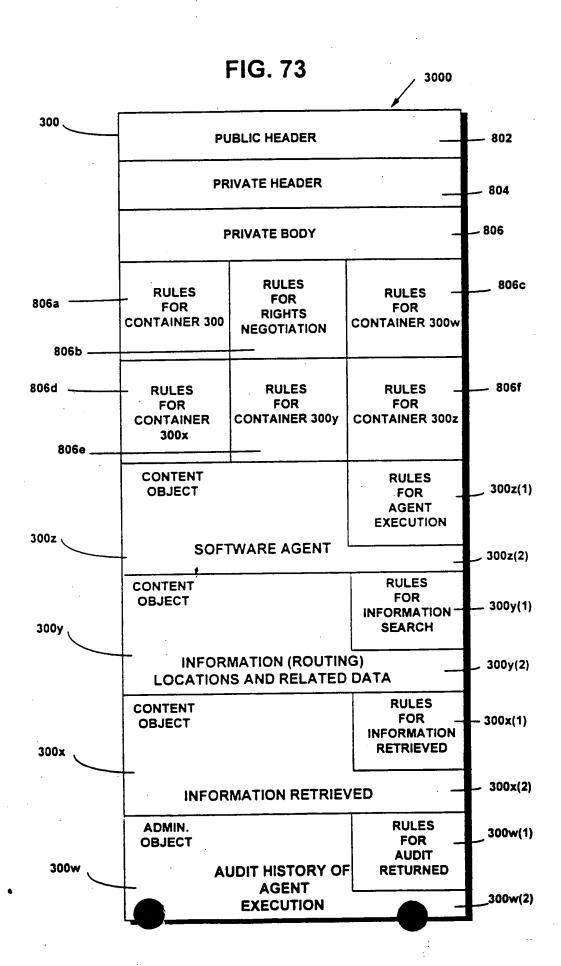
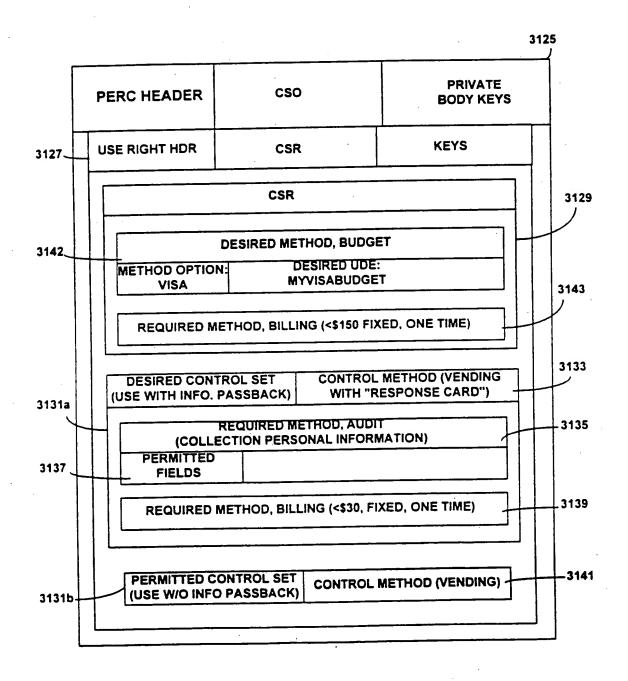


FIG. 75B



**FIG. 75A** 

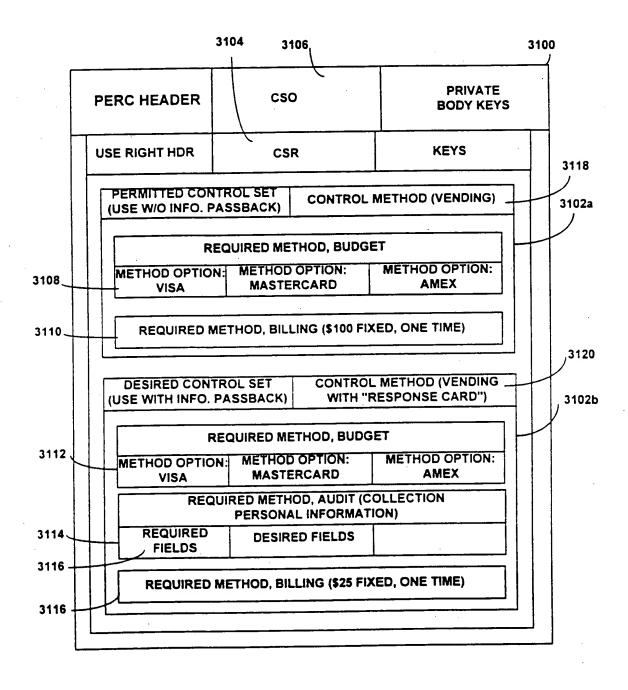
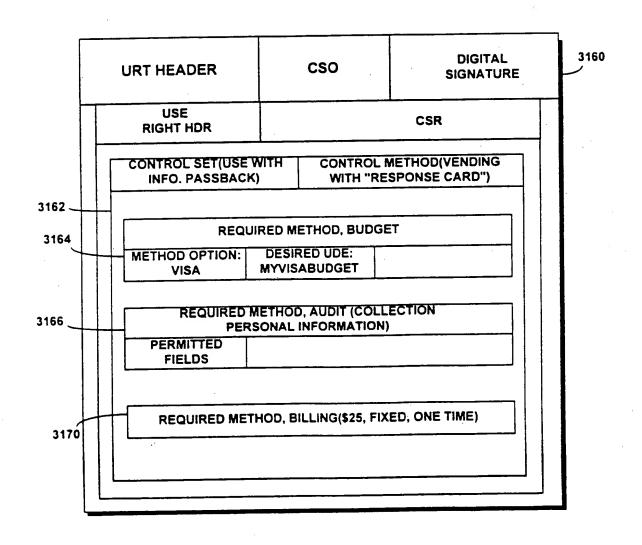


FIG. 75D



**FIG. 75C** 

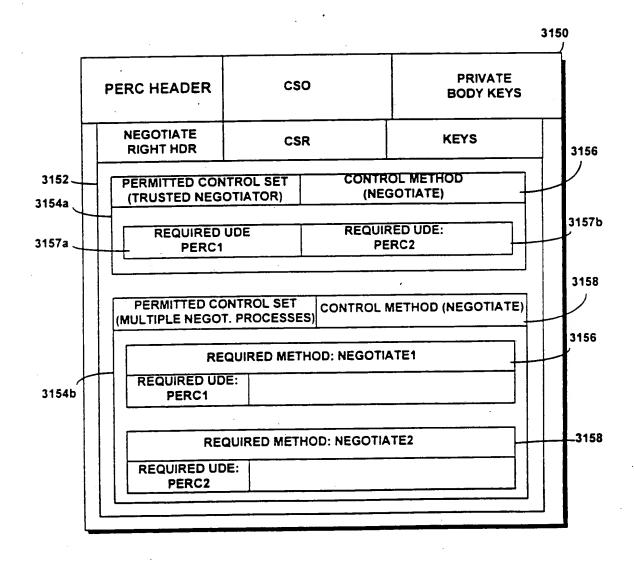
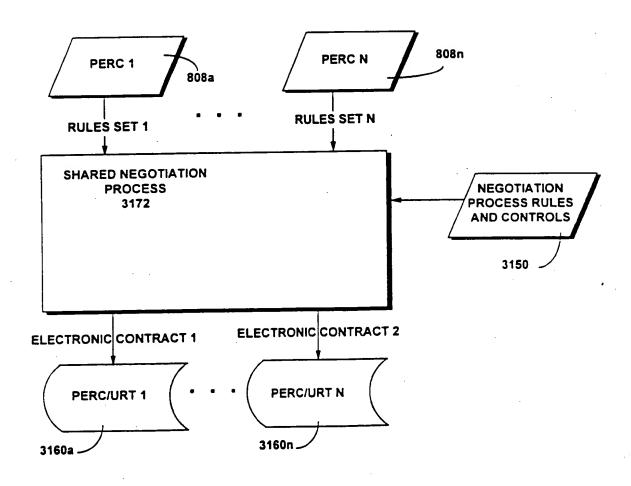
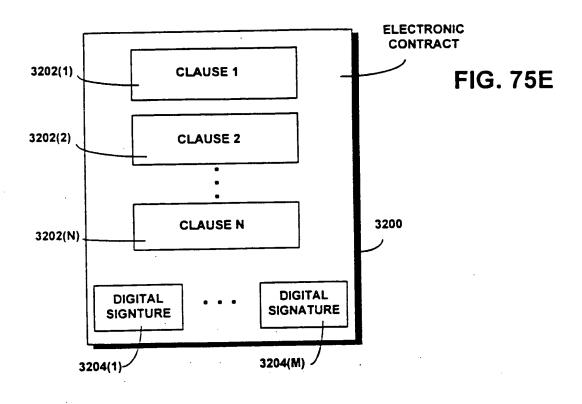
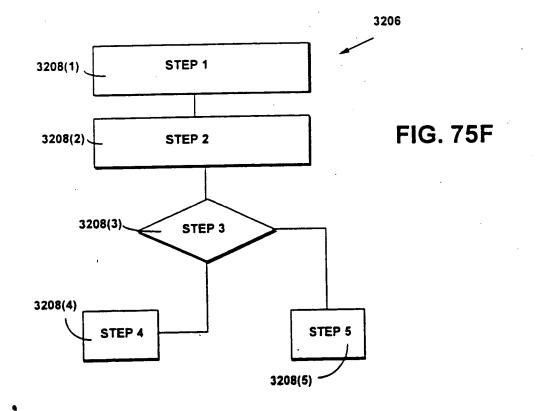


FIG. 76A







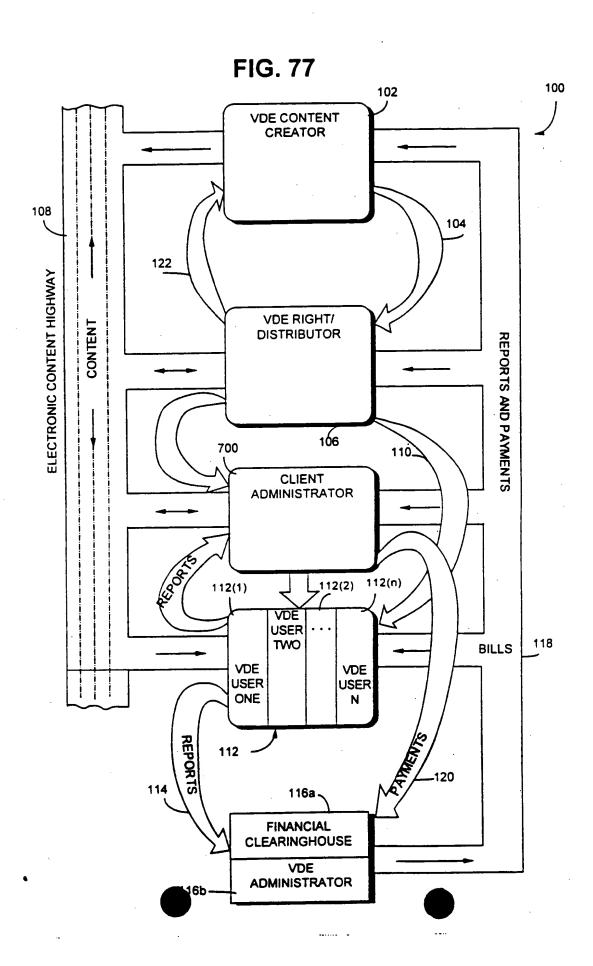
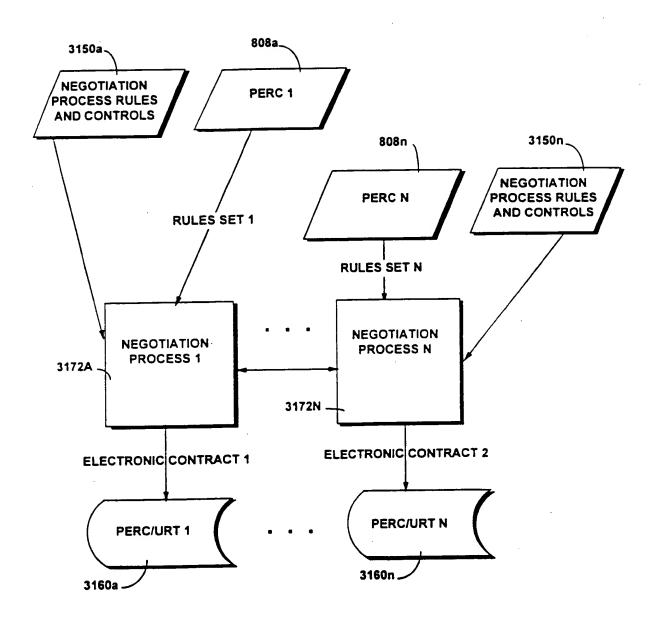
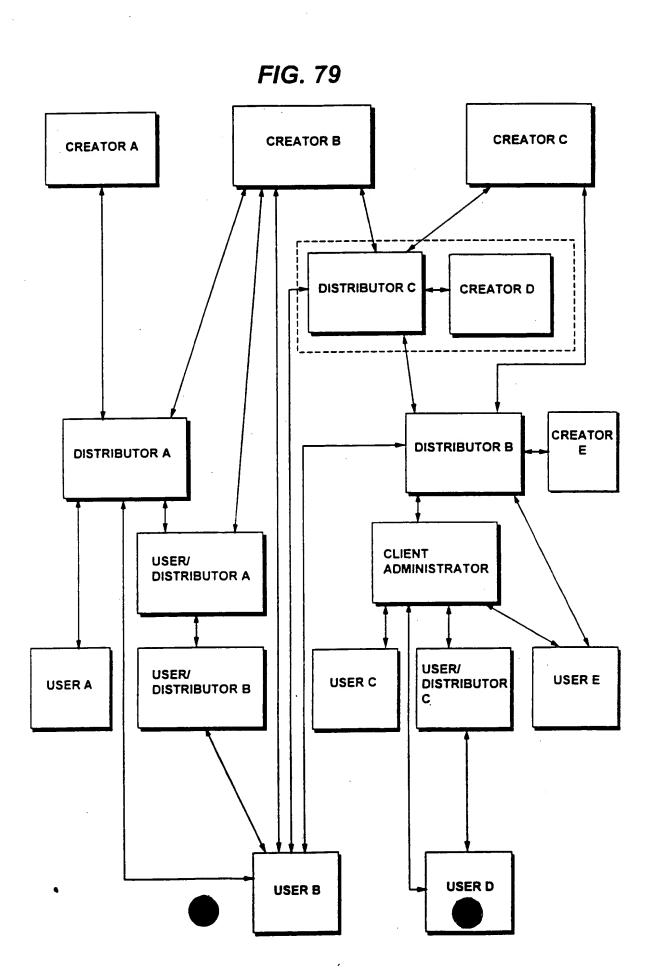
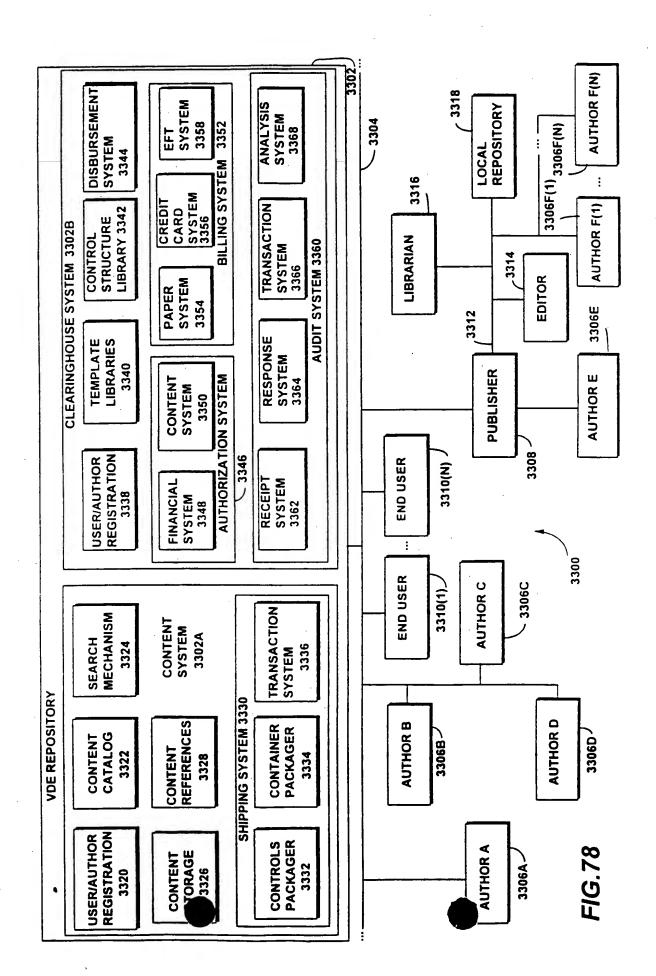


FIG. 76B







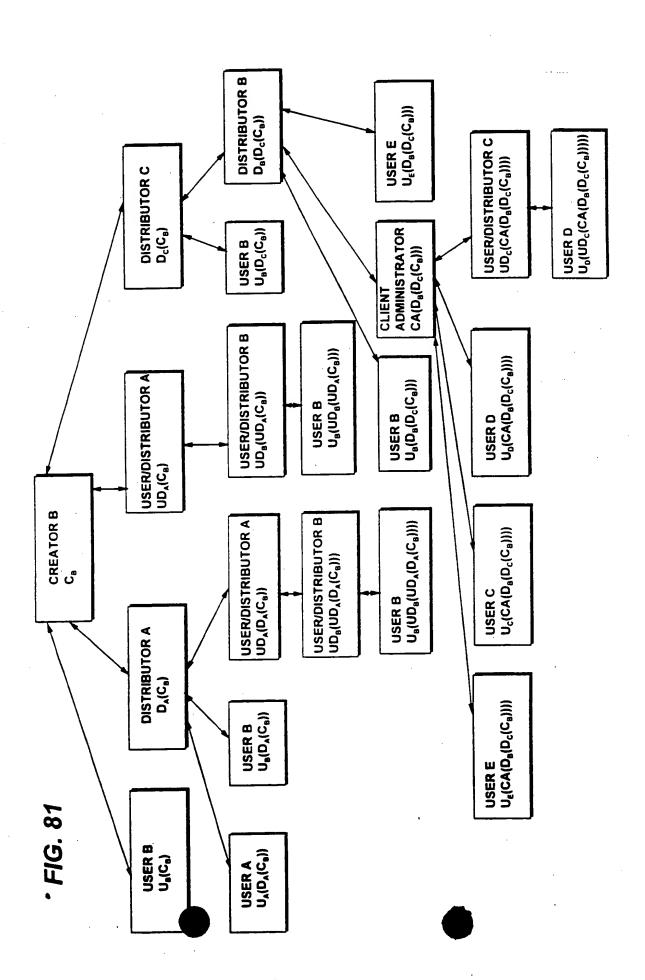
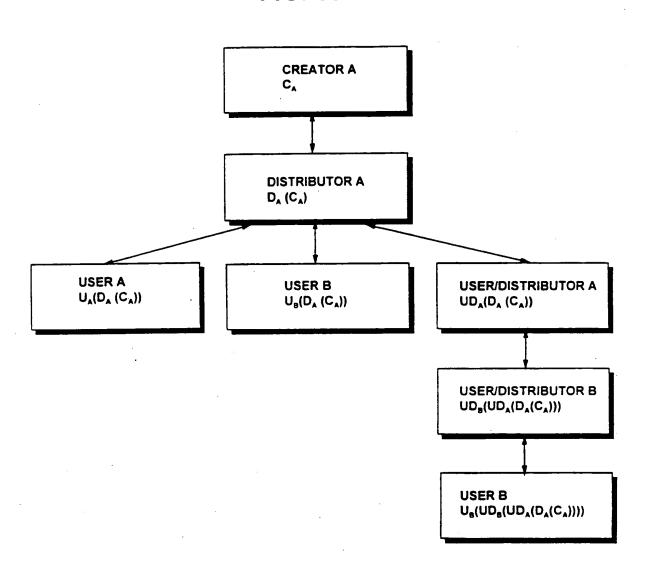
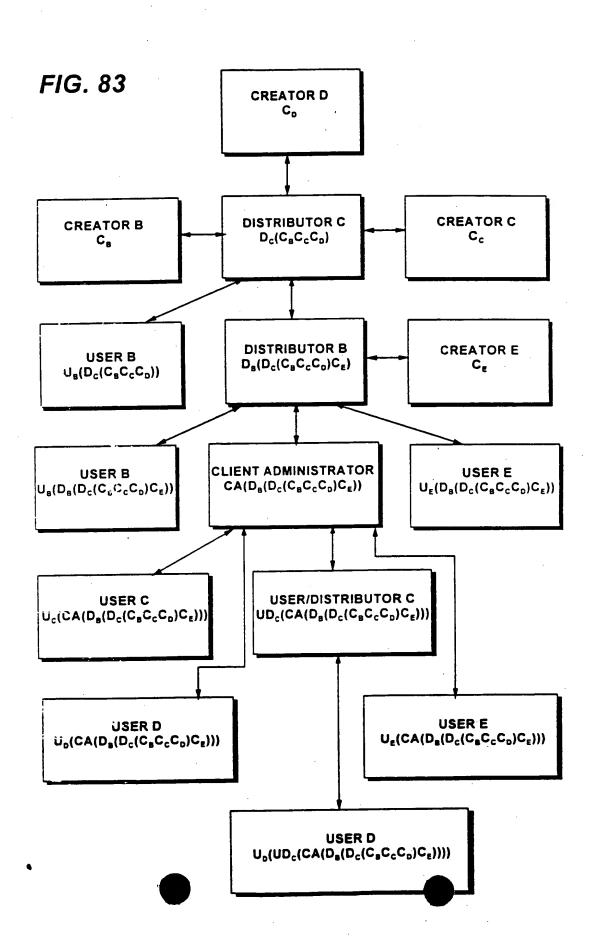
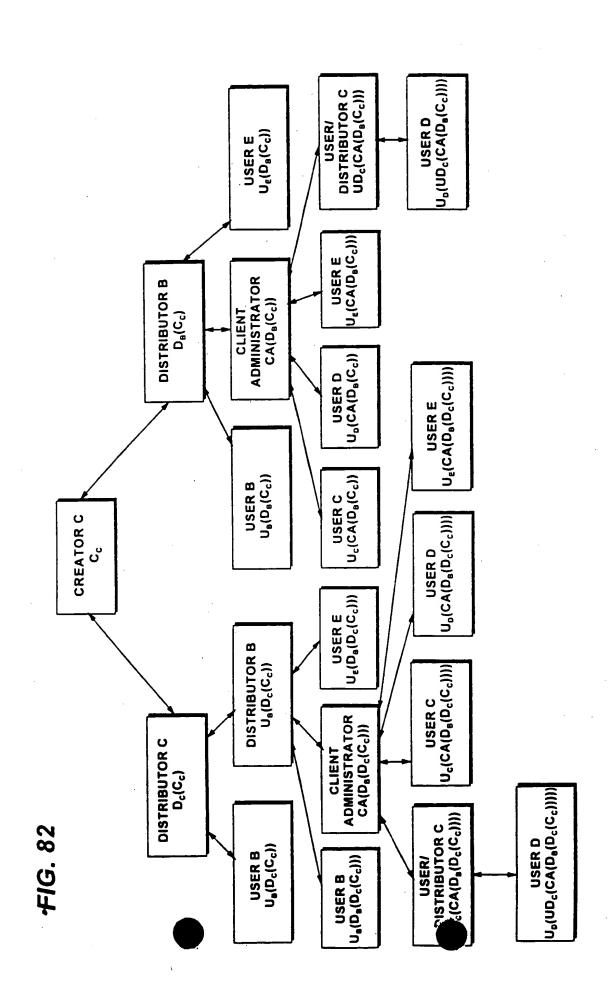


FIG. 80







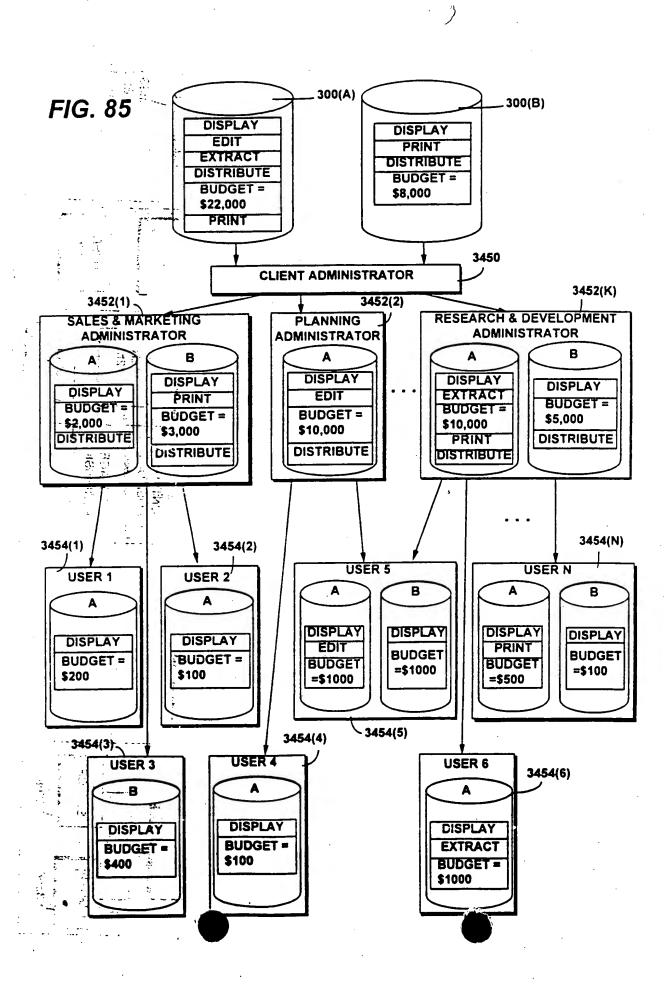
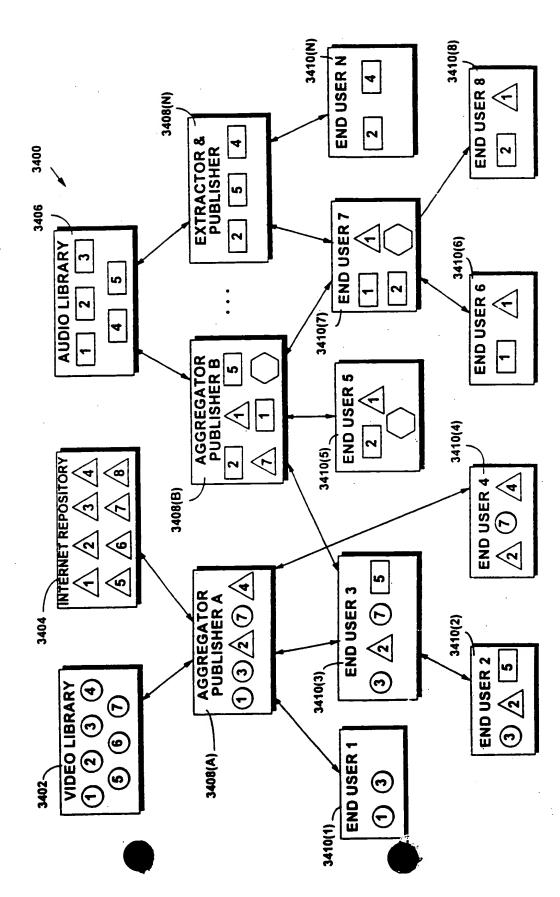


FIG. 84



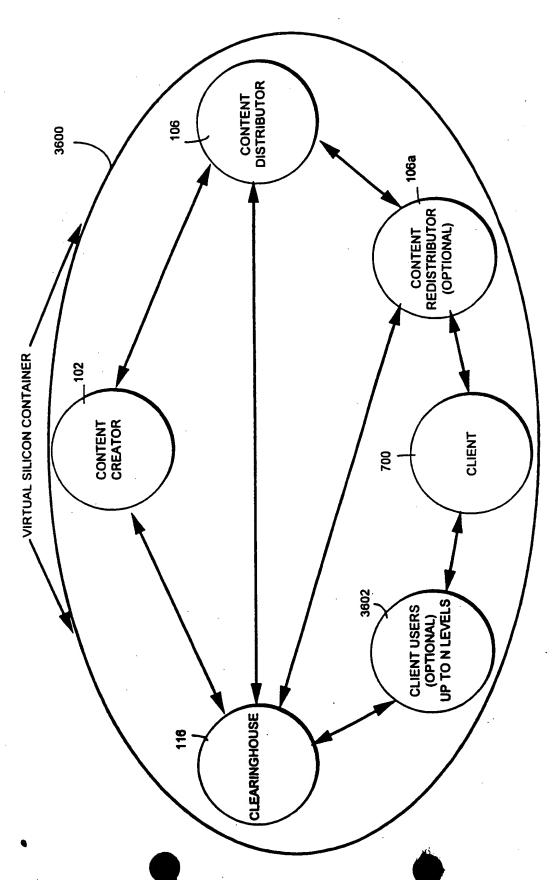


FIG. 87

